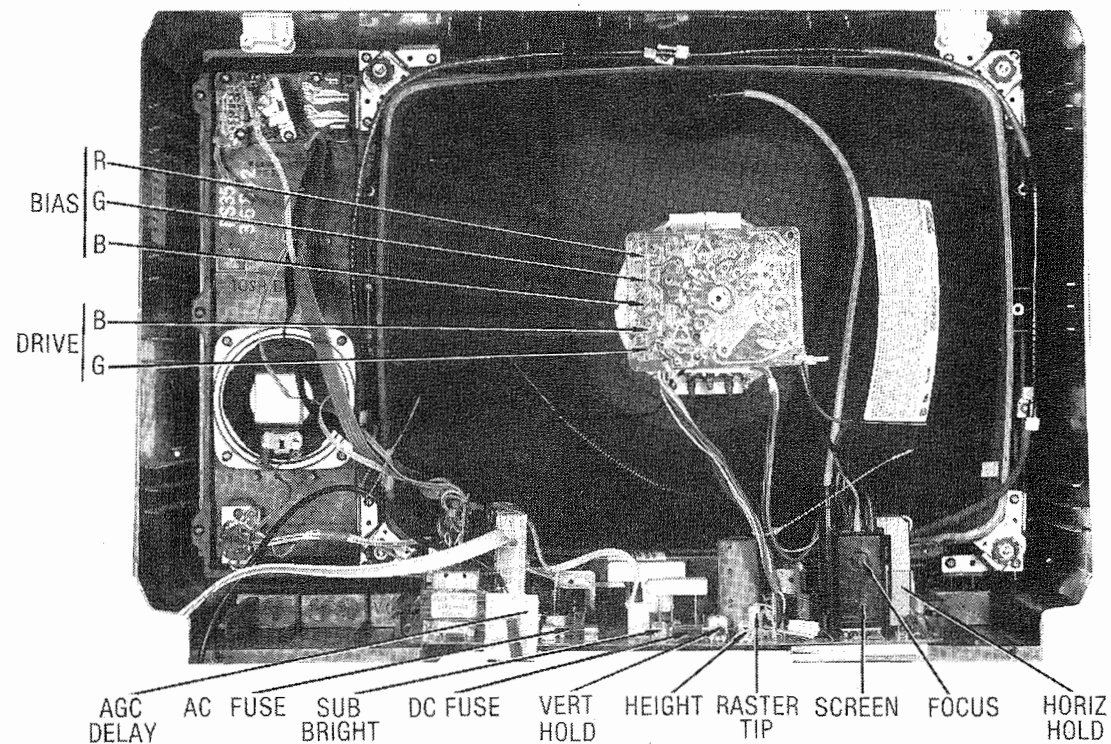




CABINET-REAR VIEW

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

Remove five screws holding cabinet back and remove back. Channel readout indicator may be removed at this point of disassembly. Remove one screw holding readout assembly to cabinet front and remove assembly from cabinet. Disconnect HV anode, CRT socket, deflection yoke connectors, degaussing coil connectors, speaker connectors and ground leads. Remove four screws holding remote receiver and tuning selector panel assembly to cabinet front and remove assembly from cabinet. Remove one

screw holding Volume/Power Switch assembly to cabinet front and remove assembly from cabinet. Slide main board assembly out of cabinet.

CRT REMOVAL

Follow "Chassis Removal" procedure and lay set facedown on a soft protective surface. Loosen and remove CRT neck assemblies. Remove four nuts holding degaussing coil and CRT to cabinet front. Lift CRT out of cabinet. Do Not lift CRT by the neck.

SERVICING IN THE FIELD

CRT IMPLSION PROTECTION AND CLEANING

Implosion protection is an integral part of the picture tube, cleaning accomplished without CRT removal.

FUSE DEVICES

A 1.2-amp fuse is used for low-voltage power-supply protection. (See photo, Cabinet - Rear View.)

A 3-amp fuse is used for AC line protection. (See photo, Cabinet - Rear View.)

READOUT ACCESSIBILITY

Readout is accessible after removing cabinet back.

VHF/UHF TUNER

Ten buttons are provided for two digit channel

entry plus two for channel scanning up and down. Fine tuning is automatic.

HORIZONTAL OSCILLATOR

Adjustment of the horizontal hold is accomplished by the proper setting of the Horiz Hold. (See photo, Cabinet - Rear View.)

FOCUS

The focus may be varied by a focus control. (See photo, Cabinet - Rear View.)

AGC

The AGC may be varied by an AGC Delay control. (See photo, Cabinet - Rear View.)

SET 2288 FOLDER 2

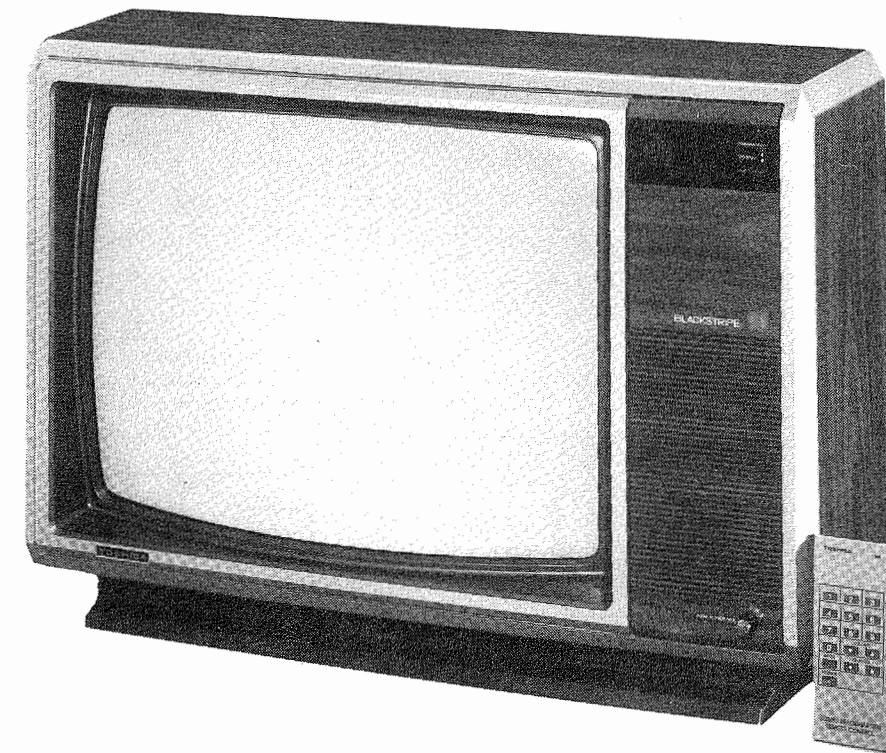
SAMS

PHOTOFACT®

For Supplier Address See PHOTOFACT® Index

TOSHIBA CHASSIS
TAC8321,TAC8322,TAC8323,TAC8361

MODEL	CHASSIS
CF903	TAC8322
CF913	TAC8321
CJ920C	TAC8361
CJ950C	TAC8361
CX9403	TAC8323



Model CF913

SAFETY PRECAUTIONS

See page 5.

SERVICE INFORMATION

See page 15.

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SAMS

Howard W. Sams & Co., Inc.

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The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed.

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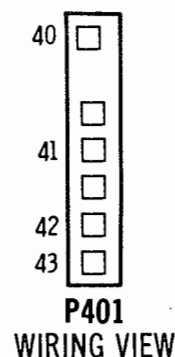
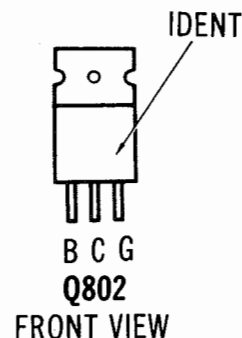
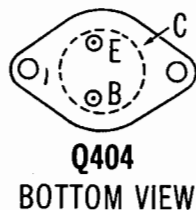
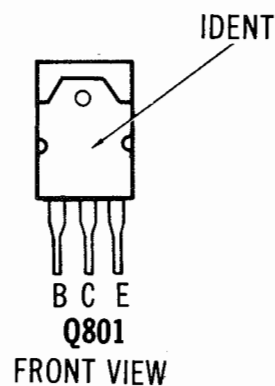
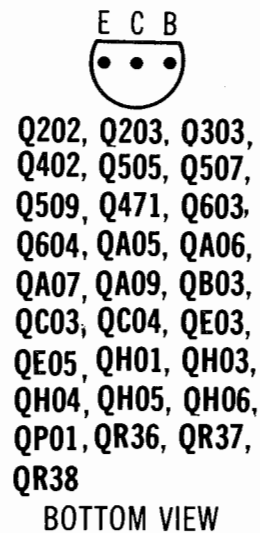
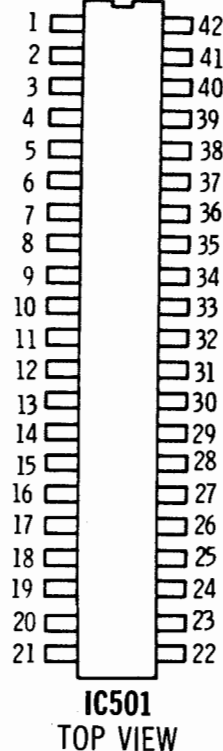
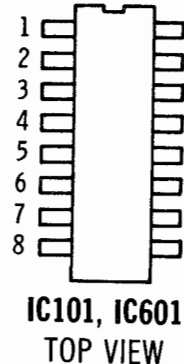
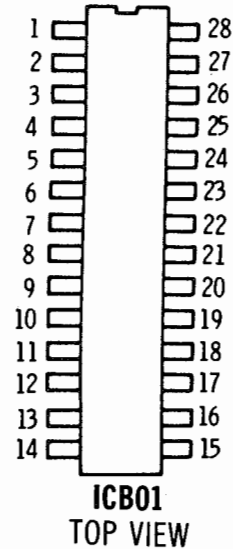
DATE 12-84 SET 2288 FOLDER 2

TOSHIBA CHASSIS
TAC8321,TAC8322,TAC8323,TAC8361

SET 2288 FOLDER 2



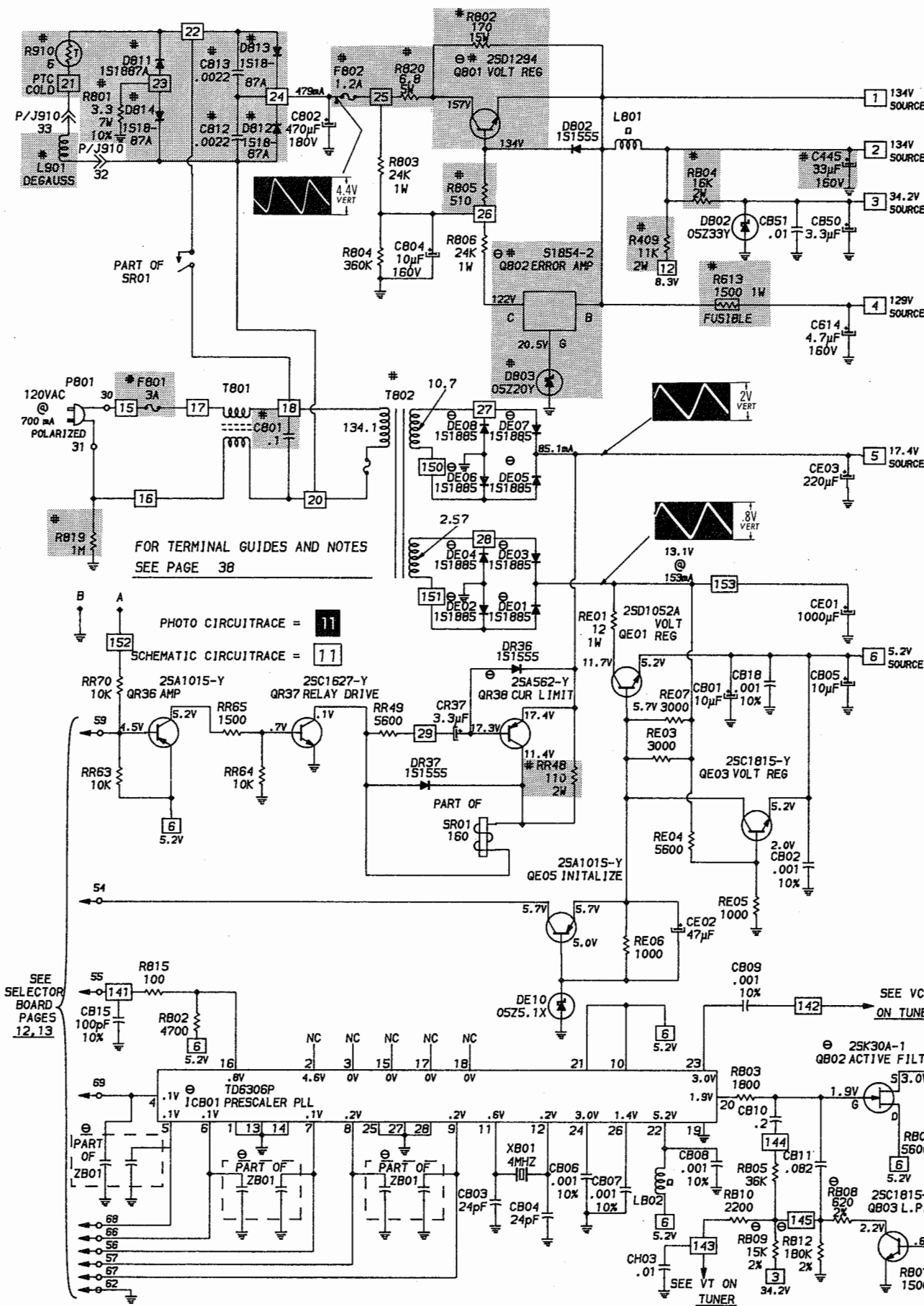
TERMINAL GUIDES



TERMINAL GUIDES

For SAFETY use only equivalent replacement part, see parts list.

- Circuitry not used in some versions
 - - - Circuitry used in some versions
 - See parts list
 - Nominal value
 - Ground
- Waveforms and voltages are taken from ground, unless noted otherwise.
- Waveforms: triggered scope, keyed rainbow generator.
- Item numbers in rectangles appear in the alignment/adjustment instructions.
- Supply voltages maintained as shown at input.
- Voltages measured with digital meter, no signal.
- Controls adjusted for normal operation.
- Terminal identification may not be found on unit.
- Capacitors are 50 volts or less, 5% unless noted.
- Electrolytic capacitors are 50 volts or less, 20% unless noted.
- Resistors are 1/2W or less, 5% unless noted.
- Value in () used in some versions.

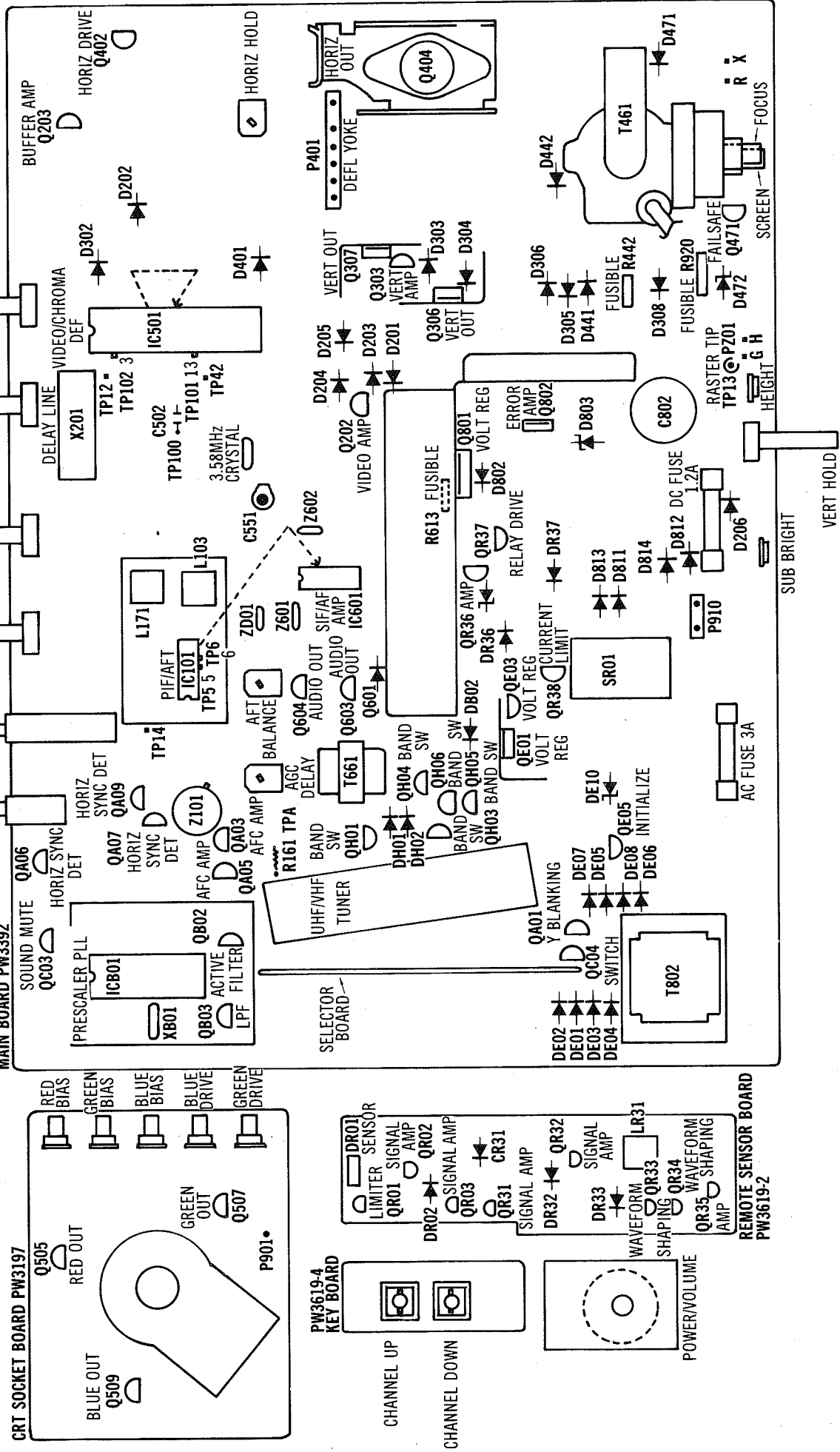


TOSHIBA CHASSIS
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FOLDER 2
POWER SUPPLY

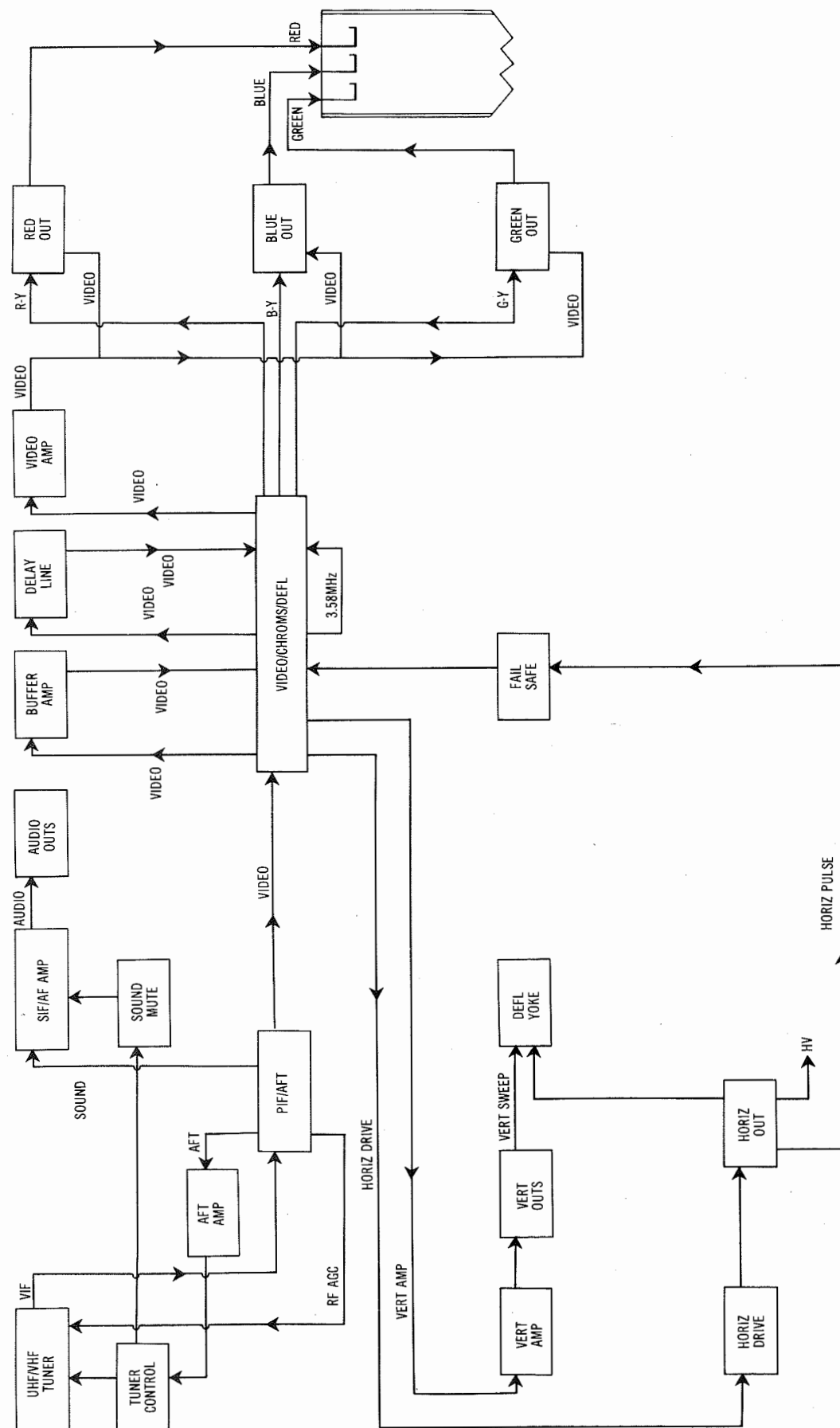
PLACEMENT
CHART

TOP VIEW



RESISTANCE MEASUREMENTS

MEASUREMENTS TAKEN WITH LOW POWER OHMS METER														
ITEM	PIN 1	PIN 2	PIN 3	PIN 4	PIN 5	PIN 6	PIN 7	PIN 8	PIN 9	PIN 10	PIN 11	PIN 12	PIN 13	PIN 14
IC101	12K	9180	102K	41K	9320	9530	15K	2780	2780	15K	431	2400	0	INF
													PIN 15	PIN 16
													9170	12K
IC501	31K	2000	437	1290	18K	2700	1820	39K	4510	56K	0	8020	INF	4230
	PIN 15	PIN 16	PIN 17	PIN 18	PIN 19	PIN 20	PIN 21	PIN 22	PIN 23	PIN 24	PIN 25	PIN 26	PIN 27	PIN 28
	INF	8890	INF	INF	2200	2000	2200	8670	43K	37K	14K	879	76K	INF
	PIN 29	PIN 30	PIN 31	PIN 32	PIN 33	PIN 34	PIN 35	PIN 36	PIN 37	PIN 38	PIN 39	PIN 40	PIN 41	PIN 42
	18K	310K	246K	0	2630	16K	57K	20K	9100	INF	436K	52K	17K	1770
IC601	INF	INF	0	469	5030	11K	19K	INF	5950	5800	7990	INF	7420	1860
													PIN 15	PIN 16
													5830	56K
IC801	0	INF	INF	7090	6980	6780	6920	7020	7060	1870	INF	INF	0	0
	PIN 15	PIN 16	PIN 17	PIN 18	PIN 19	PIN 20	PIN 21	PIN 22	PIN 23	PIN 24	PIN 25	PIN 26	PIN 27	PIN 28
	INF	6370	INF	INF	0	INF	1870	1870	INF	INF	0	2450	0	0
V901	INF	NC	NC	NC	0	INF	8.5M	INF	FIL	FIL	INF	NC		
ITEM	E	B	C		ITEM	E	B	C		ITEM	E	B	C	
Q202	474	8220	62		Q604	0	1000	49K		QE01	2450	8130	6660	
Q203	5600	1770	432		Q801	11K	34K	11K		QE03	2450	1000	8130	
Q303	0	1206	INF		Q802	59K	11K	58K		QE05	8130	9130	6660	
Q306	67K	INF	INF		QA05	1.2M	44K	68K		QH01	431	10K	814	
Q307	67K	INF	0		QA06	2460	51K	27K		QH03	431	10K	711	
Q402	0	40K	14K		QA07	INF	3900	50K		QH04	0	5170	13K	
Q404	0	.50	11K		QA09	0	10K	INF		QH05	0	5360	74K	
Q471	5550	121K	33K		QB02	2020	INF	1878		QH06	0	4790	72K	
Q505	618	2810	INF		QB03	0	1276	31K		QR36	2450	12K	11K	
Q507	617	2800	INF		QC03	0	16K	4940		QR37	0	10K	4260	
Q509	599	2780	INF		QC04	0	6720	5670		QR38	4000	1.7M	4110	
Q603	54K	49K	11K							QP01	0	6210	8660	

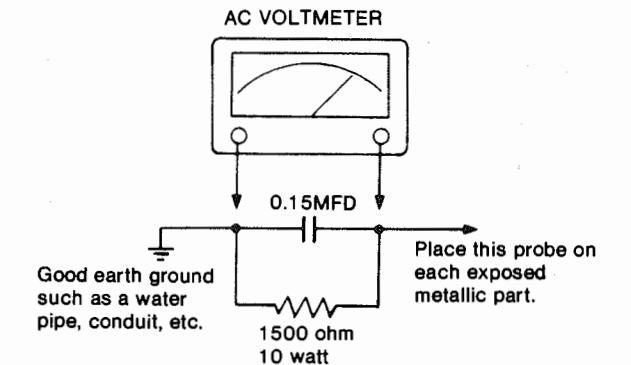


SAFETY PRECAUTIONS

WARNING: Service should not be attempted by anyone unfamiliar with the necessary precautions on this receiver. The following are the necessary precautions to be observed before servicing this chassis.

1. Since the chassis of this receiver has hazardous potential to ground whenever the receiver is plugged in (floating chassis), an isolation transformer should be used during any dynamic service to avoid possible shock hazard.
2. Always discharge the picture tube anode to the CRT conductive coating before handling the picture tube. The picture tube is highly evacuated and if broken, glass fragments will be violently expelled. Use shatter proof goggles and keep picture tube away from the unprotected body while handling.
3. When replacing a chassis in the cabinet, always be certain that all the protective devices are put back in place, such as; non-metallic control knobs, insulating covers, shields, isolation resistor-capacitor network etc.
4. Before returning the set to the customer, always perform an AC leakage current check on the exposed metallic parts of the cabinet, such as antennas, terminals, screwheads, metal overlays, control shafts etc. to be sure the set is safe to operate without danger of electrical shock. Plug the AC line cord directly into a 120V AC outlet (do not use a line isolation transformer during this check). Use an AC voltmeter having 5000 ohms per volt or more sensitivity in the following manner:

Connect a 1500 ohm 10 watt resistor, paralleled by a 0.15 mfd, AC type capacitor, between a known good earth ground (water pipe, conduit, etc.) and the exposed metallic parts, one at a time. Measure the AC voltage across the combination of 1500 ohm resistor and 0.15 mfd capacitor. Reverse the AC plug at the AC outlet and repeat AC voltage measurements for each exposed metallic part. Voltage measured must not exceed 0.3 volts RMS. This corresponds to 0.2 milliamp. AC. Any value exceeding this limit constitutes a potential shock hazard and must be corrected immediately.



PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in this chassis have special safety-related characteristics. These characteristics are often passed unnoticed by a visual inspection and the protection afforded by them cannot necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this manual and its supplements; electrical components having such features are identified by shading on the schematic diagram.

Before replacing any of these components, read the parts list in this manual carefully. The use of substitute replacement parts which do not have the same safety characteristics as specified in the parts list may create shock, fire, X-ray radiation or other hazards.

SERVICE NOTES

1. When replacing parts or circuit boards, clamp the lead wires to terminals before soldering.
2. When replacing a high wattage resistor (oxide metal film resistor) on circuit board, keep the resistor 10mm (1/2 in.) away from circuit board.
3. Keep wires away from high voltage or high temperature components.

X-RAY RADIATION PRECAUTION

1. Excessive high voltage can produce potentially hazardous X-RAY RADIATION. To avoid such hazards, the high voltage must not be above the specified limit. The nominal value of the high voltage of this receiver is 27.8 kV at zero beam current (minimum brightness) under a 120V AC power source. The high voltage must not, under any circumstances, exceed 30.0 kV. Each time a receiver requires servicing, the high voltage should be checked following the HIGH VOLTAGE CHECK

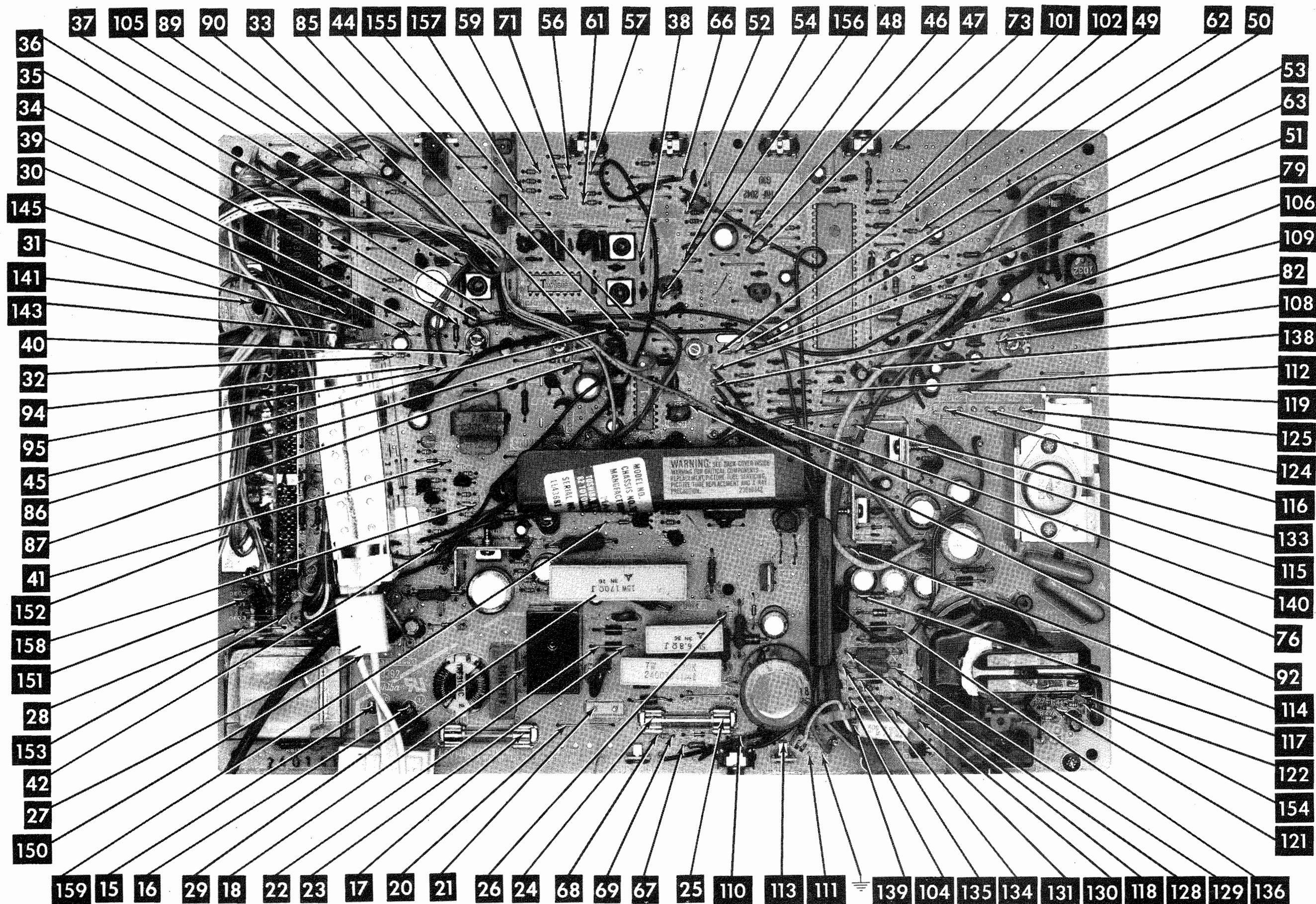
It is recommended that the reading of the high voltage be recorded as a part of the service record. It is important to use an accurate and reliable high voltage meter.

2. This receiver is equipped with a Fail Safe (FS) circuit which

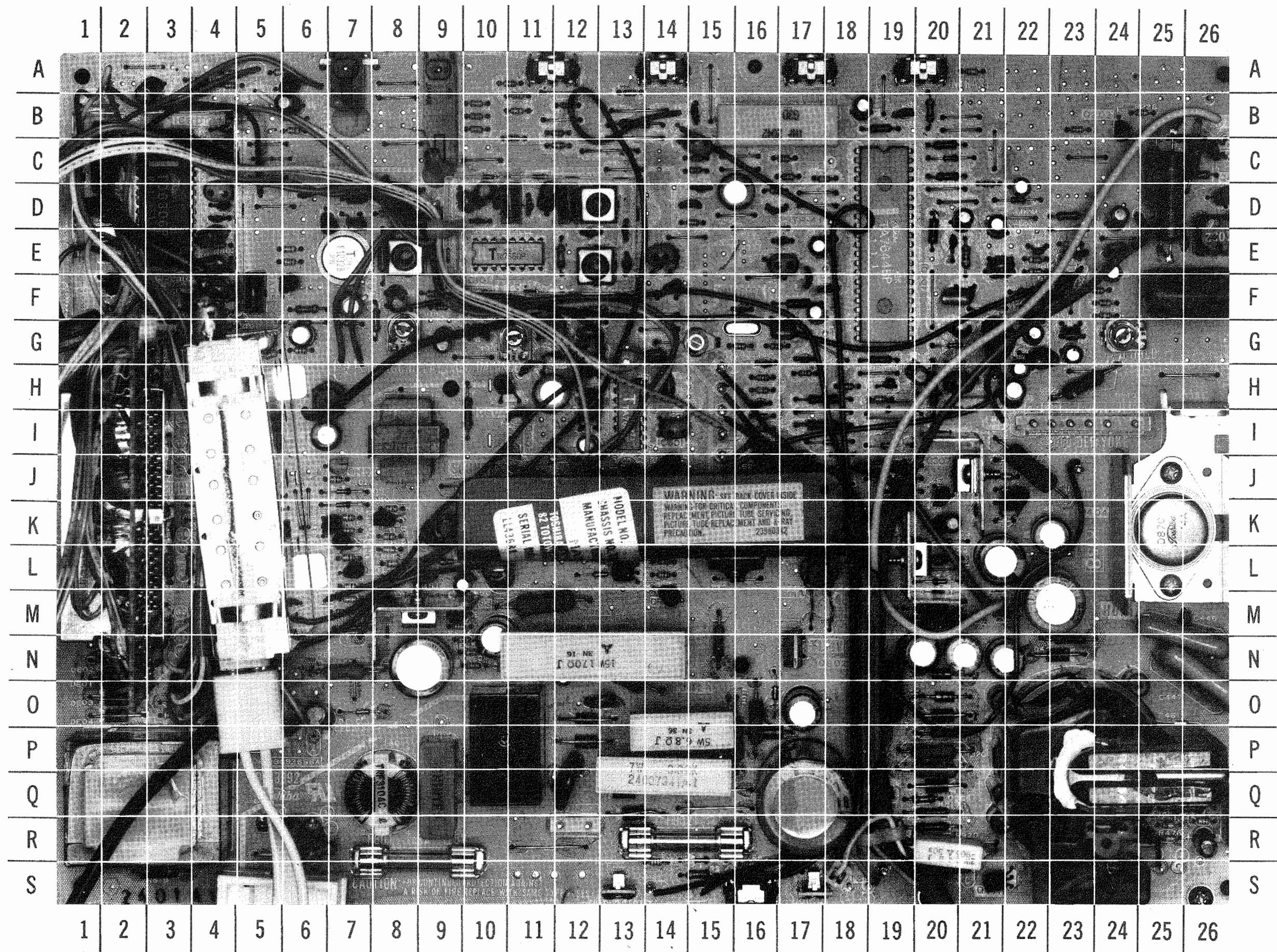
prevents the receiver from producing an excessively high voltage even if the B+ voltage increases abnormally. Each time the receiver is serviced, the FS circuit must be checked to determine that the circuit is properly functioning, following the FS CIRCUIT CHECK procedure on page 3 of this manual.

3. The only source of X-RAY RADIATION in this TV receiver is the picture tube. For continued X-RAY RADIATION protection, the replacement tube must be exactly the same type tube as specified in the parts list.
4. Some parts in this receiver have special safety-related characteristics for X-RAY RADIATION protection. For continued safety, parts replacement should be undertaken only after referring to the PRODUCT SAFETY NOTICE below.

Courtesy of the Manufacturer



MAIN BOARD



TOSHIBA CHASSIS
TAC8321, TAC8322, TAC8323, TAC8361

FOLDER 2

MAIN BOARD

A Howard W. Sams GRIDTRACE™ Photo

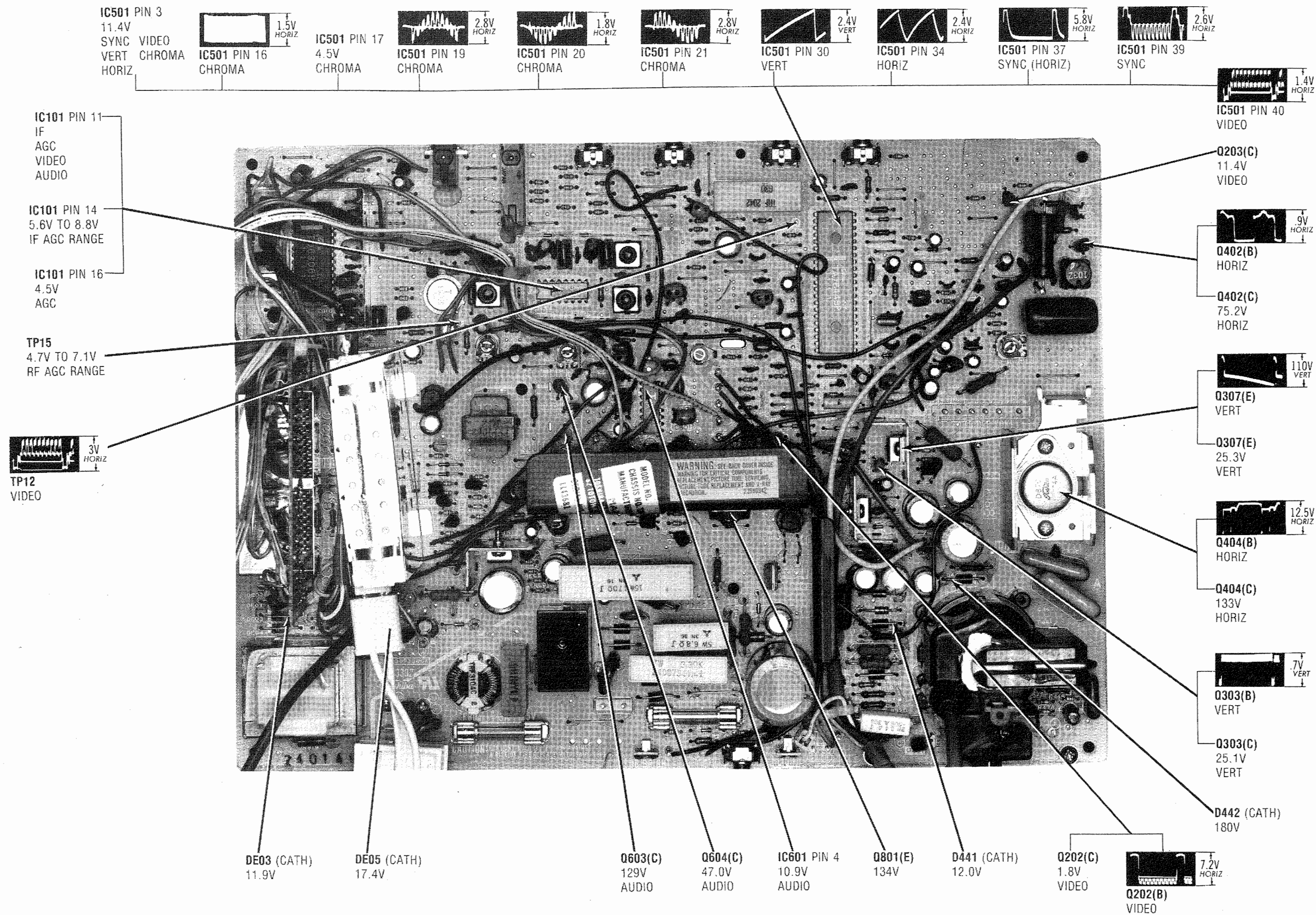
MAIN BOARD

MAIN BOARD-GridTrace LOCATION GUIDE

C102	E-9	C514	F-16	D811	P-12	QH04	K-8	R351	S-16	RA23	G-7	Z601	H-12
C103	D-10	C515	G-17	D812	Q-13	QH05	L-7	R352	S-17	RA24	F-6	Z602	H-14
C104	F-8	C516	H-16	D813	Q-12	QH06	K-7	R402	Q-20	RA28	E-6	ZB01	C-2
C105	G-10	C517	J-16	D814	Q-13	QP01	O-4	R403	F-24	RA30	A-6		
C107	Q-12	C518	I-16	DA01	G-6	QR36	L-13	R404	F-24	RA31	B-6		
C108	D-10	C519	H-16	DB01	L-9	QR37	M-14	R405	Q-23	RA32	B-6		
C109	F-12	C551	G-15	DE01	N-2	QR38	N-11	R406	F-22	RA36	D-8		
C110	D-12	C601	H-12	DE02	N-2	R101	E-9	R407	F-24	RB02	E-4		
C111	D-10	C602	H-12	DE03	Q-2	R103	F-9	R409	C-25	RB03	E-4		
C114	D-11	C603	H-11	DE04	Q-2	R104	E-8	R410	H-20	RB04	J-22		
C116	D-10	C604	I-12	DE05	Q-4	R105	F-12	R411	E-21	RB05	F-4		
C171	E-12	C605	I-12	DE06	P-4	R106	E-12	R424	C-26	RB06	F-3		
C172	E-13	C606	Q-14	DE07	Q-4	R107	F-9	R425	C-26	RB07	F-2		
C173	E-13	C608	J-13	DE08	P-4	R108	G-8	R426	D-25	RB08	F-3		
C174	F-10	C611	K-14	DE10	Q-7	R152	G-8	R441	I-17	RB09	G-4		
C175	F-11	C612	K-13	DH01	K-7	R158	G-11	R442	Q-20	RB10	G-4		
C201	B-19	C613	K-9	DH02	K-7	R161	G-6	R443	N-23	RB12	F-4		
C203	D-15	C614	K-11	DR34	L-13	R171	F-10	R445	R-26	RB15	F-2		
C204	D-24	C615	K-12	DR36	M-11	R172	G-11	R451	Q-24	RC02	Q-3		
C205	B-18	C616	J-14	DR37	N-13	R201	B-20	R472	Q-26	RC05	A-4		
C206	S-17	C617	I-11	F801	R-8	R202	C-21	R475	S-23	RC06	A-4		
C207	D-22	C801	Q-9	F802	R-14	R203	F-12	R476	R-25	RC07	A-4		
C208	E-14	C802	Q-17	G	S-18	R204	C-15	R477	R-25	RC08	B-3		
C209	F-14	C804	Q-17	H	S-19	R205	C-15	R478	S-22	RE01	N-7		
C301	D-21	C812	Q-14	IC101	E-10	R207	C-20	R480	H-20	RE03	N-10		
C303	E-22	C813	Q-13	IC501	D-19	R208	B-19	R481	S-23	RE04	M-9		
C304	E-23	CA01	F-7	IC601	H-13	R209	C-17	R482	S-22	RE05	N-10		
C305	G-22	CA15	B-6	ICB01	C-3	R210	G-12	R501	D-16	RE06	O-6		
C307	H-19	CA16	D-7	L102	E-8	R211	C-17	R503	E-18	RE07	N-10		
C308	G-21	CA17	D-8	L103	E-12	R212	C-17	R504	D-15	RH01	F-8		
C309	G-21	CB01	D-2	L104	G-11	R213	Q-19	R505	F-17	RH02	J-7		
C311	N-22	CB02	D-2	L105	D-11	R214	S-15	R509	B-13	RH03	K-8		
C312	K-22	CB03	E-2	L106	D-12	R215	D-23	R511	K-16	RH04	K-7		
C313	Q-19	CB04	E-2	L161	F-5	R216	C-26	R512	I-16	RH05	K-7		
C314	N-21	CB05	E-4	L171	D-12	R217	C-26	R513	H-16	RH06	M-7		
C315	L-21	CB06	C-4	L201	G-12	R218	S-14	R514	G-17	RH07	L-8		
C316	J-22	CB07	B-4	L203	C-15	R221	H-17	R515	G-16	RH08	L-8		
C317	H-22	CB08	D-4	L204	E-14	R222	J-17	R516	H-17	RH09	L-8		
C319	G-22	CB09	C-4	L401	H-21	R223	R-20	R517	G-16	RH10	L-7		
C321	D-21	CB10	F-4	L441	M-26	R226	J-18	R518	K-17	RH11	L-7		
C322	E-21	CB11	E-4	L443	I-19	R227	J-18	R519	I-16	RH12	M-7		
C323	L-20	CB15	F-3	L501	E-17	R228	B-25	R520	H-16	RH13	M-7		
C401	E-24	CB18	D-4	L601	I-14	R229	H-18	R554	A-11	RH19	Q-20		
C402	E-24	CB50	L-9	L801	L-17	R230	F-13	R555	A-14	RH20	Q-20		
C403	G-23	CB51	L-9	LB02	D-4	R235	B-23	R561	B-10	RP01	Q-4		
C404	G-20	CC01	A-3	LH01	H-6	R254	A-20	R562	B-11	RP02	N-4		
C405	G-23	CE01	N-9	P201	S-18	R255	A-17	R563	B-11	RR47	M-11		
C406	H-22	CE02	Q-6	P401	I-23	R257	S-13	R564	A-11	RR48	Q-13		
C407	F-21	CE03	M-10	P910	R-12	R281	A-21	R565	B-12	RR49	N-12		
C410	F-22	CH01	G-6	Q202	J-17	R282	A-13	R566	C-12	RR63	L-13		
C413	E-20	CH02	G-9	Q203	B-24	R284	B-11	R567	B-12	RR64	L-14		
C424	C-26	CH03	G-3	Q303	J-20	R285	B-10	R568	B-11	RR65	L-14		
C425	E-26	CR36	L-10	Q306	L-20	R301	C-20	R601	H-12	S501	A-9		
C442	N-20	CR37	N-12	Q307	J-21	R303	E-21	R602	H-11	SA04	A-7		
C443	F-26	D201	K-18	Q402	D-20	R305	E-22	R604	J-12	SR01	P-10		
C445	M-23	D202	D-22	Q404	K-25	R306	E-22	R606	I-14	T400	E-26		
C446	N-26	D203	K-18	Q471	S-21	R308	F-23	R607	J-13	T461	Q-24		
C447	Q-26	D204	I-18	Q603	I-11	R309	S-16	R608	K-13	T661	I-8		
C448	R-26	D205	I-19	Q604	H-10	R310	H-19	R609	K-13	T801	Q-8		
C449	K-23	D206	R-15	Q801	L-16	R311	J-19	R611	J-12	T802	Q-2		
C461	D-16	D302	C-20	Q802	N-17	R312	I-20	R612	I-10	TPA	F-5		
C462	I-16	D303	K-20	QA05	F-6	R313	E-23	R613	K-15	TP5	E-11		
C463	I-6	D304	L-20	QA06	A-6	R315	S-17	R801	Q-14	TP6	E-11		
C471	R-26	D305	Q-20	QA07	D-6	R316	M-20	R802	N-12	TP12	C-18		
C473	H-20	D306	N-20	QA09	D-7	R317	M-20	R803	P-16	TP13	S-18		
C501	D-16	D308	Q-20	QB02	F-3	R318	P-20	R804	P-16	TP14	D-9		
C502	E-17	D401	G-20	QB03	F-2	R319	E-20	R805	N-15	TP100	D-16		
C503	D-15	D441	Q-20	QC03	A-4	R320	P-20	R806	O-16	TP101	E-18		
C505	E-17	D442	N-23	QC04	N-3	R321	J-22	R819	S-3	TP102	C-18		
C508	F-17	D471	Q-26	QE01	M-9	R322	J-22	R820	P-15	X201	B-16		
C509	B-15	D472	S-20	QE03	M-9	R323	J-22	R910	Q-12	X501	G-16		
C511	G-17	D601	J-11	QE05	O-6	R324	R-18	R920	R-20	XB01	E-2		
C512	F-18	D802	L-16	QH01	J-7	R325	H-23	RASTER TIP	S-18	Z101	E-7		
C513	F-17	D803	Q-16	QH03	K-7	R328	G-22	RA22	E-6	Z201	G-12		

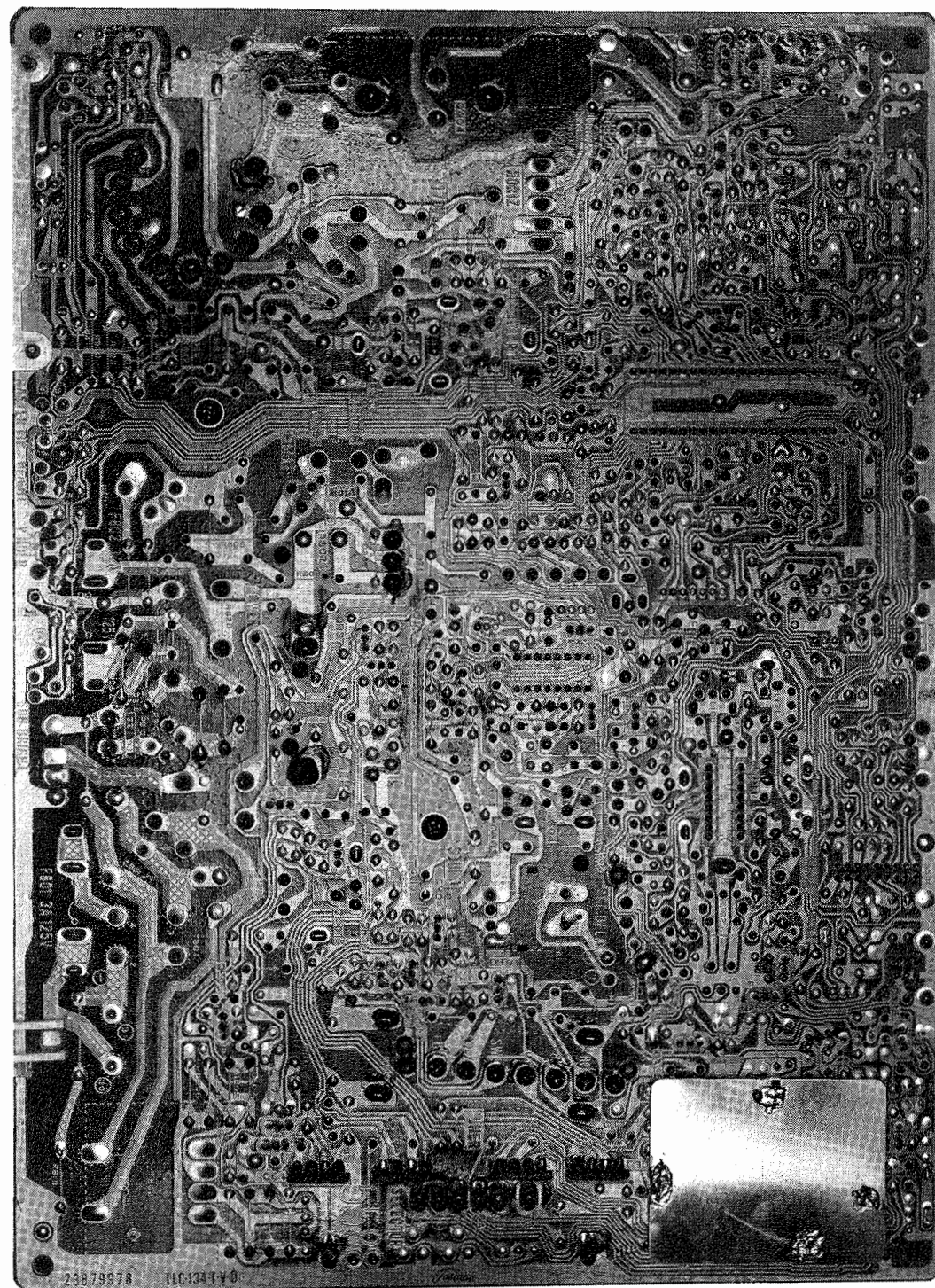
TOSHIBA CHASSIS
TAC8321,TAC8322,TAC8323,TAC8361

FOLDER 2

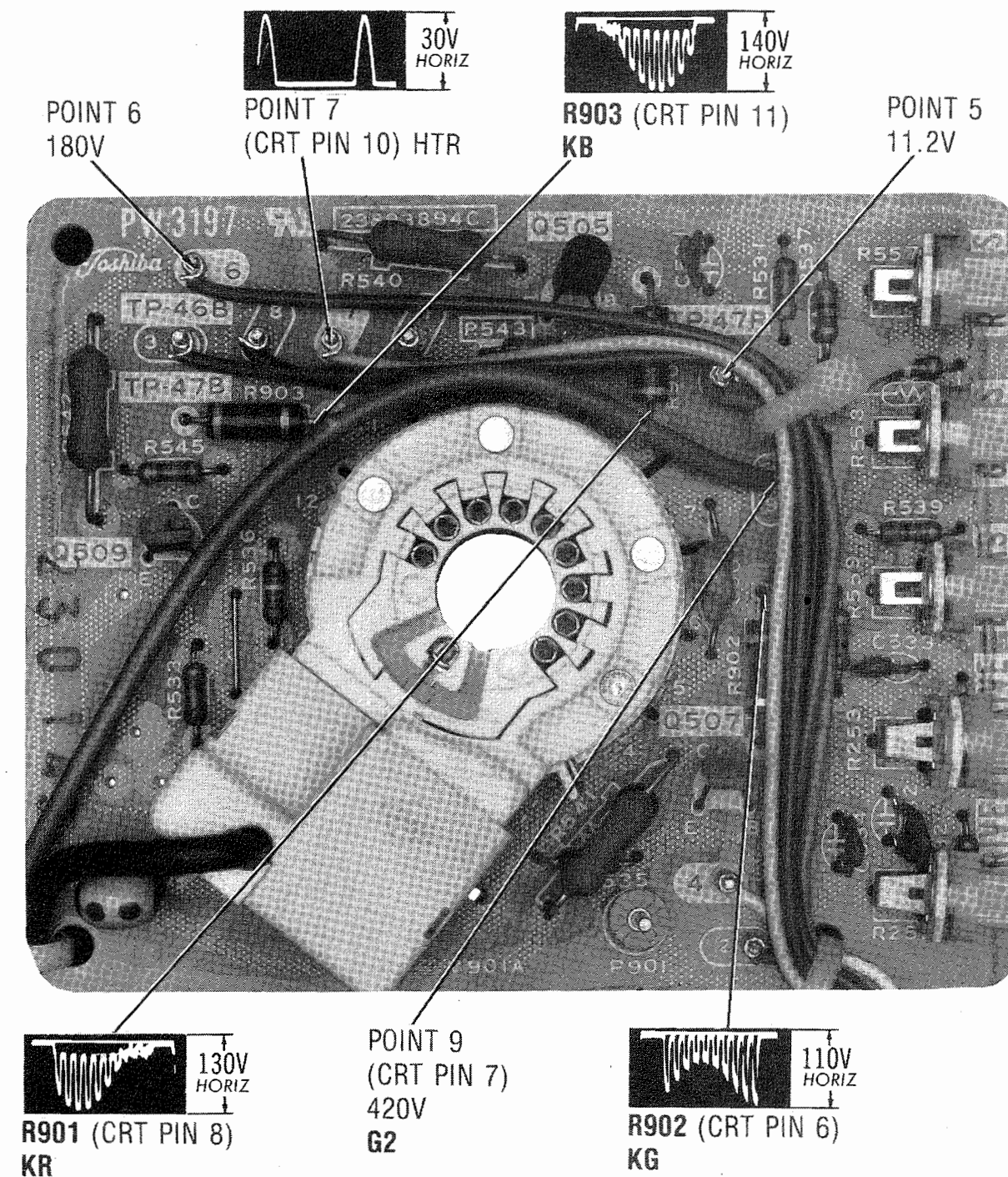


TOSHIBA CHASSIS
TAC8321, TAC8322, TAC8323, TAC8361

FOLDER 2
31

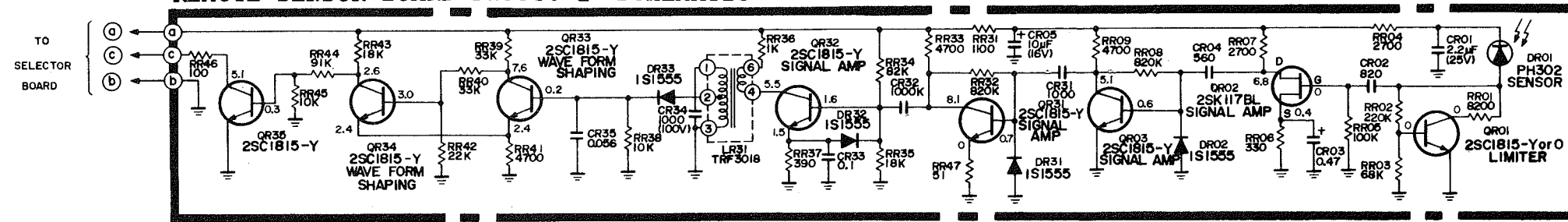


MAIN BOARD-SHIELD LOCATION GUIDE

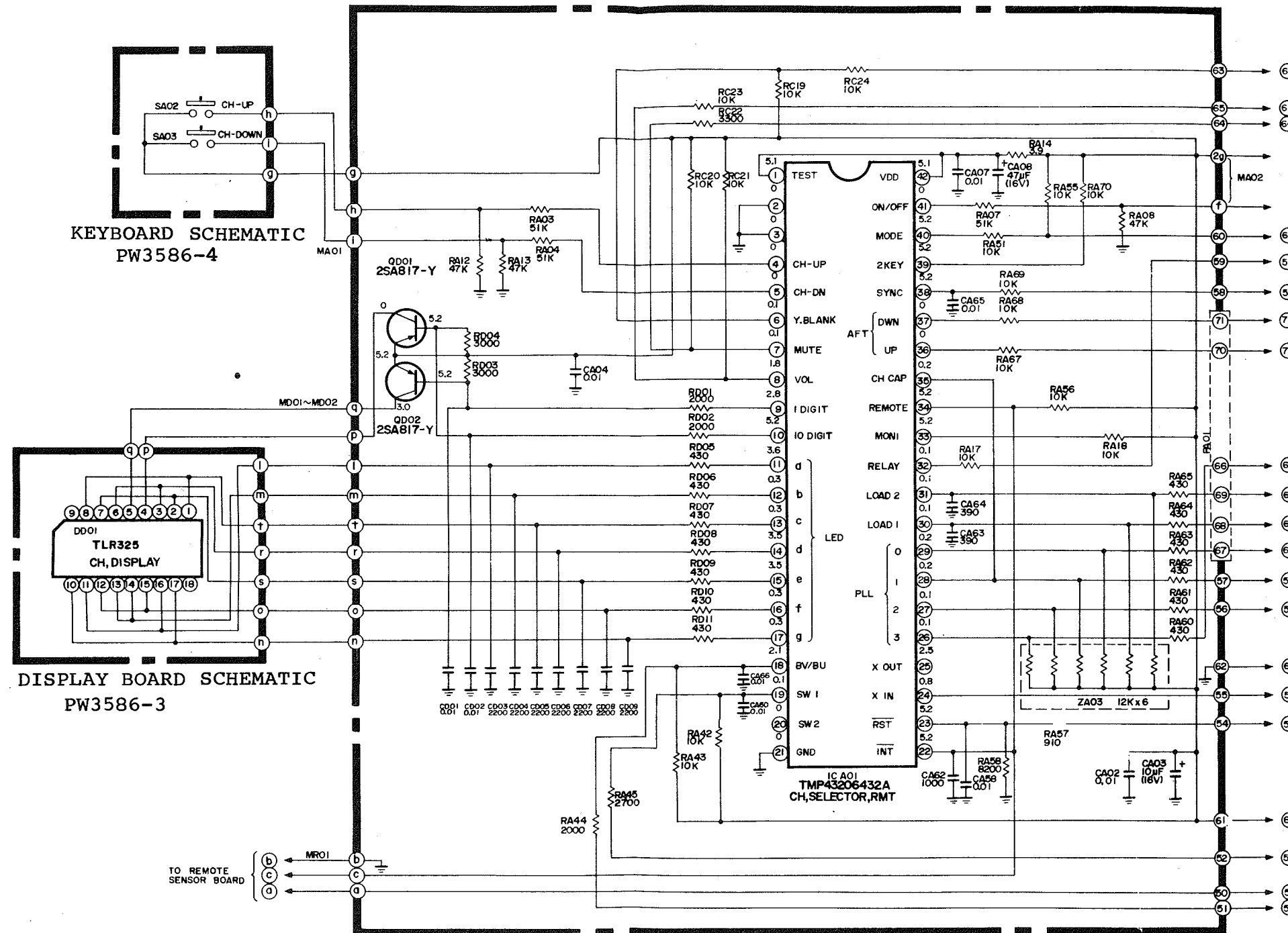


TOSHIBA CHASSIS
TAC8321, TAC8322, TAC8323, TAC8361

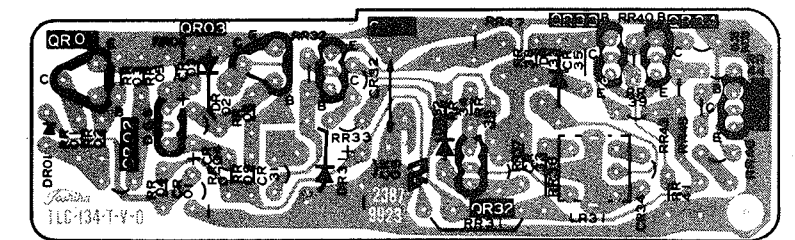
REMOTE SENSOR BOARD PW3586-2 SCHEMATIC



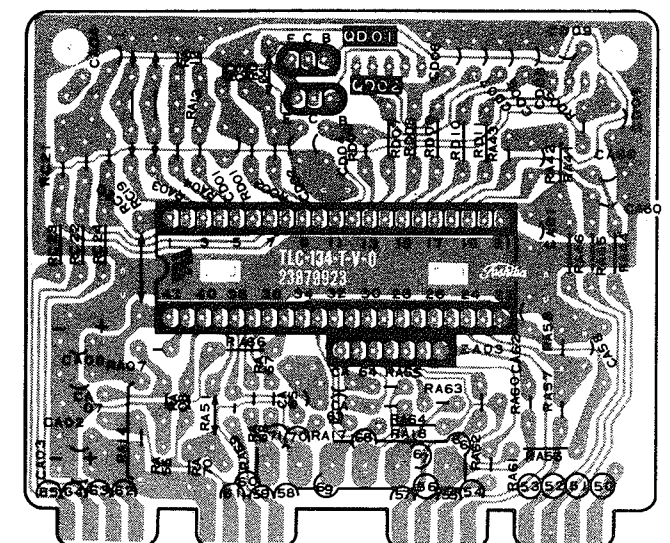
SELECTOR BOARD PW3586-1 SCHEMATIC



REMOTE SENSOR BOARD PW3586-2



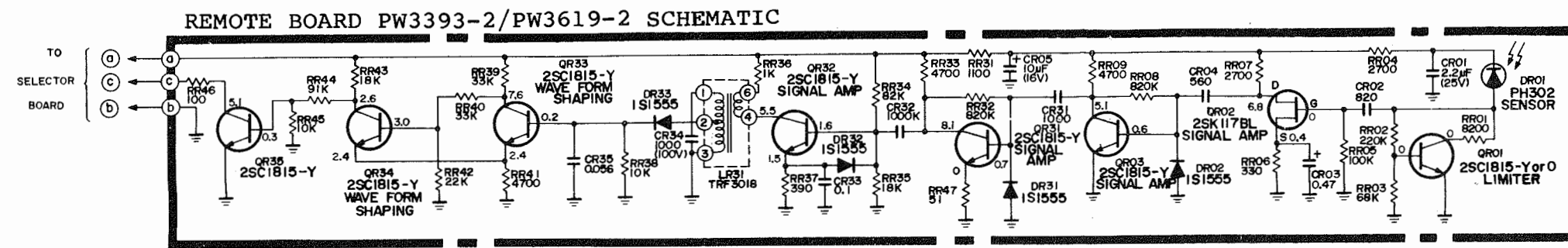
SELECTOR BOARD PW3586-1



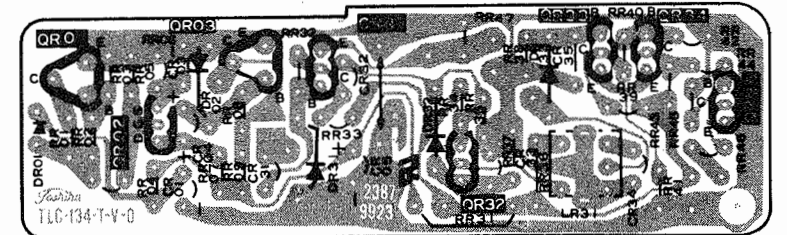
TOSHIBA CHASSIS
TAC8321, TAC8322, TAC8323, TAC8361

FOLDER 2

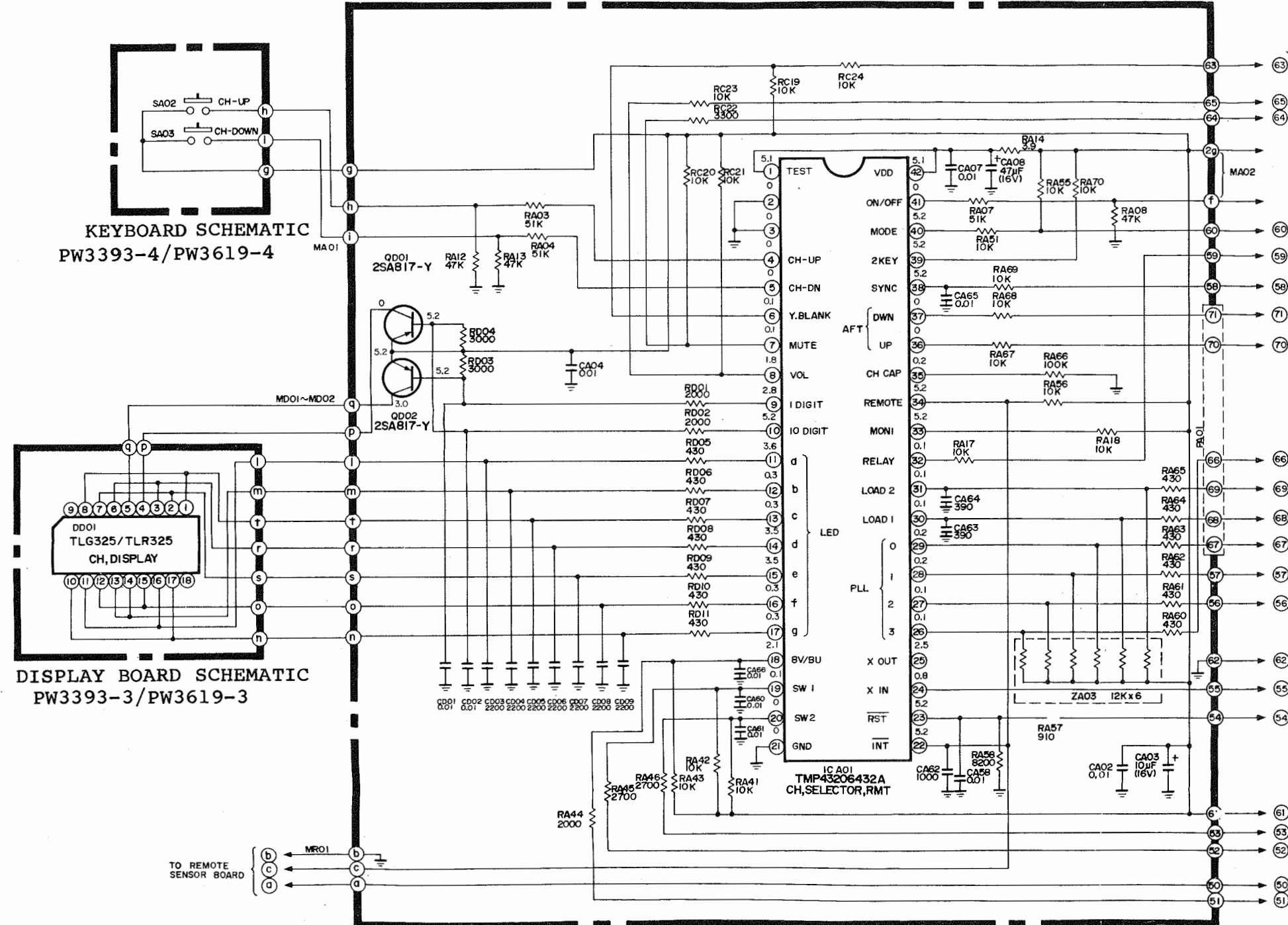
Courtesy of the Manufacturer



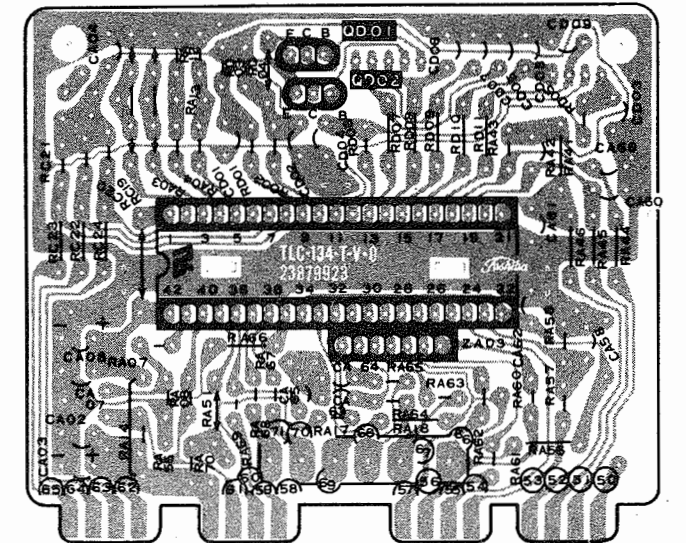
REMOTE BOARD PW3393-2/PW3619-2



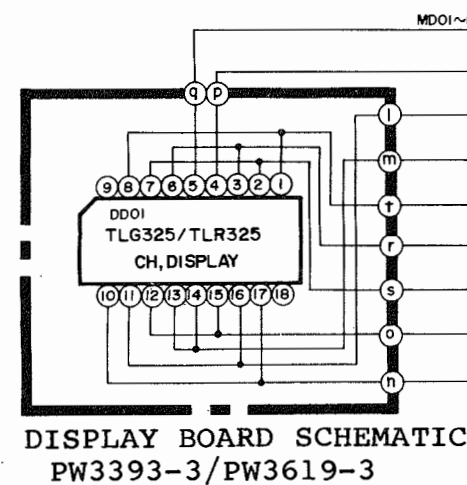
SELECTOR BOARD PW3393-1/PW3619-1 SCHEMATIC



SELECTOR BOARD PW3393-1/PW3619-1



KEYBOARD SCHEMATIC
PW3393-4/PW3619-4



DISPLAY BOARD SCHEMATIC
PW3393-3/PW3619-3

Courtesy of the Manufacturer

TOSHIBA CHASSIS
TAC8321, TAC8322, TAC8323, TAC8361

FOLDER 2

TV ALIGNMENT INSTRUCTIONS

Use an isolation transformer, or observe polarity, and maintain line voltage at 120VAC. Allow a 20-minute warm-up period for receiver and test equipment.
Suggested Alignment Tools: GC ELECTRONICS
L103, L171.....9440

PRELIMINARY INSTRUCTIONS

Set the channel selector to the highest unused channel. Set scope sweep to external. Connect scope vertical input to scope vertical input on sweep/marker generator. Connect scope external horizontal input to scope horizontal input on sweep/marker generator. Ground test equipment to TV chassis unless specified otherwise. Use only enough generator output to provide a usable indication.
Note: Response may vary slightly from that shown.

Connect a +7.30V bias to TP14.
Set AGC Delay Control (R152) fully counterclockwise.
Open printed circuit at TPA. (Bottom of main board).

VIDEO IF ALIGNMENT (SWEEP MARKER GENERATOR)

DIRECT PROBE FROM SWEEP/MARKER GENERATOR	SWEEP GENERATOR OUTPUT	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	REMARKS
Thru 100K ohm resistor to TP12	Thru 10K ohm resistor to TPA	44MHz (10MHz Sweep)	45.75MHz	Adjust L103 for Maximum gain and symmetry of response. See Figure 1. NOTE: After completing alignment resolder circuit at TPA and readjust AGC Delay Control (R152).

VIDEO IF ALIGNMENT (BAR SWEEP GENERATOR)

BAR SWEEP GENERATOR	SCOPE INPUT	REMARKS
To Antenna Terminals	To TP12	Perform Video IF Adjustments per SWEEP/MARKER GENERATOR Instructions above. See Figure 2.

AUTOMATIC FINE TUNING ALIGNMENT

Connect as explained in preliminary instructions unless specified otherwise. Connect a +3.00V bias to TP14. Set ABC Switch to On. Open printed circuit at TPA (Bottom of main board). Connect a voltmeter to TP6, low side to TP5. Adjust AFC Balance Control (R158) for -.50V. Remove meter.

DIRECT PROBE FROM SWEEP/MARKER GENERATOR	SWEEP GENERATOR OUTPUT	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	REMARKS
To TP6	Thru 10K ohm resistor to TPA	44MHz (10MHz Sweep)	45.75MHz	NOTE: After completing AFT Balance Adjustment, adjust bias at TP14 to +7.30V. Adjust L171 for Maximum gain and to place 45.75MHz marker. See Figure 3.

NOTE: After completing alignment resolder circuit at TPA.

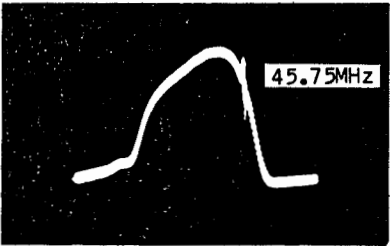


Figure 1



Figure 2

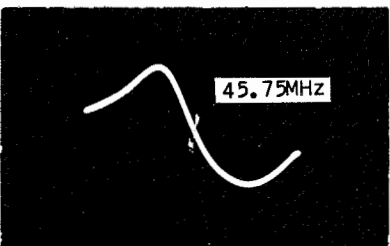


Figure 3

TROUBLESHOOTING (Continued)

pins 8, 9, 12, 13, 16, 17 and 18 of the Video/Chroma/Deflection IC (IC501). If no color sync, check the adjustment on Color Sync Capacitor (C551) and check for the 3.58MHz waveform at pins 16 and 17 of IC501. If incorrect hue (tint), check voltages and waveforms at pins 8 and 12 of IC501. Check CRT and CRT voltages.

IF-AGC

Inject an IF signal at IF input cable and check for picture information on the CRT. If picture is present, check tuner, tuner AGC and tuning circuit. If picture is not present, check for a video waveform at TP12. If video waveform is present, refer to the "Video" section of this Troubleshooting guide. If there is no video waveform at TP12, apply AGC bias at TP14. If video waveform returns, troubleshoot AGC circuit pins 3, 4 and 14 of PIF/AFC IC (IC101) and associated circuitry. Defective AGC circuit can cause overloaded picture, excessive snow or loss of picture and sound. See AGC Voltage Chart for AGC voltages with signal. If there is no video waveform with AGC bias applied at TP14, check pins 1, 2, 5 thru 10, 15 and 16 of IC101 and associated circuitry.

AGC VOLTAGE CHART

NOTE: Voltages taken with Keyed-Rainbow generator unless otherwise noted.

Pin 3 of IC101	.66V
Pin 4 of IC101	4.58V
Pin 14 of IC101	5.60V

AUDIO

Check for voltage at pin 4 of SIF/AF Amp/ IC (IC601), collector of Audio Output Transistors (Q603), and (Q604). Inject an audio signal at pin 14 of IC601. If no sound, check voltages and components associated with Transistors Q603 and Q604, Electrolytics C612 and C613, Audio Output Transformer (T661), Speaker W661 and associated circuitry. If sound is present at the speaker, check voltages at pins 5 and 6 of IC601. The voltage at pin 5 will change from 9.52V with Maximum volume to 2.23V with MINIMUM volume, the voltage at pin 6 will change from 7.35V with Maximum volume to 7.39V with MINIMUM volume. Check the voltage at pin 5 of IC601 with the mute activated it should be 1.09V. If these voltages appear at pin 5, check voltages and components associated with IC601. If these voltages don't appear at pin 5 of IC601, check voltages and components associated with the mute circuit. If sound is still absent, check voltages and components associated with IC601.

CIRCUIT DESCRIPTION

FAILSAFE

Turn On the TV set and adjust customer controls for normal operation. Short TP(R) to TP(X) temporarily with a jumper wire. The TV will loose sound and raster even after removing the jumper wire. The failsafe circuit activates and prevents excessive anode voltage from being developed by sampling horizontal pulses and B+ voltage. As soon as the high

VIDEO

Check voltages and waveforms on CRT and check CRT. Check voltages and waveforms on the base of the Red Output Transistor (Q505), Green Output Transistor (Q507), Blue Output Transistor (Q509) and the Video Amp Transistor (Q202). To help determine the defective stage, inject a video signal at TP12. Check waveforms at pins 2, 4, 7, 22 and 42 of Video/Chroma/Deflection IC (IC501). If any of the waveforms are absent, check IC501 and associated circuitry. Check for horizontal and vertical blanking signals at the base of transistor Q202. If there is no blanking or raster has retrace lines, check Diodes D204 and D205, Transistor Q202, IC501, Buffer Amp Transistor (Q203) and associated circuitry.

VERTICAL

Inject a vertical signal at the base of the Vertical Amp Transistor (Q303). If vertical deflection returns, check voltages and waveforms on pins 25, 26, 27, 28, 29, 30 and 31 of the Video/Chroma/Deflection IC (IC501) and associated circuitry. If vertical is not present, inject a vertical signal at the base of the Vertical Output Transistor (Q306). If vertical deflection returns, check Transistor Q303, Diodes D303 and D304, and Electrolytics C312, C314, C315 and C317. If the vertical deflection is still not present, check Vertical Output Transistors (Q306 and Q307), Electrolytic C315 and associated circuitry. Vertical linearity or foldover problems can be caused by vertical feedback and bias circuits. Check Diodes D303, D304, D305 and D306, Electrolytics C311, C312, C314, C315 and C317 and associated circuitry. See Resistance Measurements Chart for possible changes in feedback and bias circuitry.

RASTER

Check CRT and CRT voltages. If the raster is magenta, check voltages and waveforms at pin 20 of Video/Chroma/Deflection IC (IC501) and the Green Output Transistor (Q507). If the raster is yellow, check voltages and waveforms at pin 19 of IC501 and the Blue Output Transistor (Q509). If the raster is cyan, check voltages and waveforms at pin 21 of IC501 and the Red Output Transistor (Q505). If the raster has a keystone shape, check the Deflection Yoke (L462). If the raster has width or height problems, refer to the "Horizontal", "Vertical" and "Power Supply" sections of this Troubleshooting guide.

voltage exceeds the normal rate, higher current will flow through Diode D471. Failsafe Transistor (Q471) will be turned On and current will flow causing the collector to go higher than 0V. Voltage on pin 23 of the Video/Chroma/ Deflection IC (IC501) will be higher than 0V, which will cause the Horizontal Drive to shutdown the horizontal oscillator, eliminating the HV, causing the set to shutdown.

TEST JIG HOOKUP

FUNCTION	Chek-A-Color ADAPTER NO.	RCA / TeleMatic ADAPTER NO.	ZENITH ADAPTER NO.
CRT YOKE YOKE SETTING	B239 D4134(1) YP2A, B208, V508/V509 100mH Toward Chassis, Focus Tap.	10J683 10J719 Horiz 1.9, Vert 34, FVS-3950 Focus Voltage Supply.	852-422 852-425(2) (3) Horiz 1.8, Vert 34, Focus Tap.

P401	PIN 40	PIN 41	PIN 42	PIN 43	(P.C. Board)
(1)	Blue	Red	Orange	Yellow	
(2)	Red	Blue	Yellow	Green	

- (3) Addition of 1000 Ohm Resistor across vertical leads (Yellow-Green) eliminates most ringing.

TROUBLESHOOTING

POWER SUPPLY

Check AC Fuse (F801), if open, check Diodes D811 thru D814. Check for a short to ground from one end of DC Fuse (F802). If Fuse F802 is open, check Voltage Regulator Transistor (Q801), Error Amp Transistor (Q802), Diode D802, Zener Diode (D803), Horizontal Output Transistor (Q404) and circuits supplied with the 134V source. Replace defective parts. Apply 120V AC and check for 134V at TP91, 123V at the collector of Transistor Q404. Check sources from Horizontal Output Transformer (T461). Check for 12.0V at the cathode of Diode D441, 180V at the cathode of Diode D442, 44.0V at the cathode of Diode D308 and 22.5V at the cathode of Diode D471. If any of the sources developed from Transformer T461 is absent, check associated circuitry, if all the voltages are absent, refer to the "Horizontal" section of this Troubleshooting guide. If the remote unit does not work, check the transmitter unit and Remote Switch (SR02). Check for 17.4V at the cathode of Diodes DE05 and DE07 and for 13.06V at the cathode of Diodes DE01 and DE03. If these voltages are not present, check the resistance measurements on the winding of the Power Transformer (T802). Check for 34.2V at the cathode of Zener Diode DB02. Check voltages and components associated with Amp Transistors (QR36), Relay Drive Transistor (QR37) and Current Limiter Transistor (QR38) and check Relay SR01.

HORIZONTAL

To help determine if the problem is in the failsafe circuit or the horizontal circuit, short pin 23 of the Video/Chroma/Deflection IC (IC501) to ground. Connect AC power to the set and check for normal operation. If the TV works properly, check for 22.5V at the cathode of Diode D471. If the voltage is absent, check Diode D471, Resistor R472 and Electrolytic C471. If the voltage is good, check the voltages on the Failsafe Transistor (Q471) and check Zener Diode (D472). If the set won't operate with pin 23 of IC501 connected to

ground, troubleshoot the power supply. If the power supply checks normal, troubleshoot the horizontal circuit as follows. Check for 123V at the collector of the Horizontal Output Transistor (Q404). If the voltage is not present, check for 134V at both sides of Resistor R443. If Resistor R443 is open, check Transistor Q404, associated circuitry, and the Horizontal Output Transformer (T461). If the voltage is present, check for horizontal waveform at the base of Transistor Q404. If the waveform is not present, inject a horizontal signal at the base of Transistor Q404. If the high voltage returns, check Horizontal Drive Transistor (Q402), Horizontal Drive Transformer (T401), pins 24, 33, 34 thru 37 of IC501 and associated circuitry. If the high voltage doesn't return, check Transistor Q404 and associated circuitry. If Transistor Q404 and associated circuitry checks out as normal, check Transformer T461, the high voltage rectifier is part of the Transformer T461 and may be defective. B+ sources developed from the Horizontal Output Transformer can cause loading of the horizontal circuit. Check B+ sources rectified by Diodes D441, D442 and D308. Poor horizontal linearity or foldover can be caused by the condition of Capacitors C424, C425, C443, C446 and C447 and associated circuitry.

SYNC

If the TV has no vertical or horizontal sync, check voltages, waveforms and components associated with pins 36, 37, 38 and 39 of the Video/Chroma/Deflection IC (IC501). If the vertical is out of sync, check for the proper voltage and waveform at pins 30 and 31 of IC501. If the horizontal is out of sync, check for the proper horizontal waveform at pins 34, 35 and 36 of IC501.

CHROMA

Inject a color signal at TP12 and check for color information at TP41 and TP42. If there is no color, check voltages and waveforms at

REMOTE CONTROL RECEIVER ALIGNMENT

TUNING FREQUENCY ADJUSTMENT

When LR31 or CR34 is replaced, readjustment is required. During adjustment, keep the VOLUME DOWN Button on the remote control transmitter pressed.

1. Tune in an active channel.
2. Connect the oscilloscope to anode of DR33. (See figure 10.)
3. Turn the LR31 coil till the max. waveform amplitude is obtained. (See figure 11.)

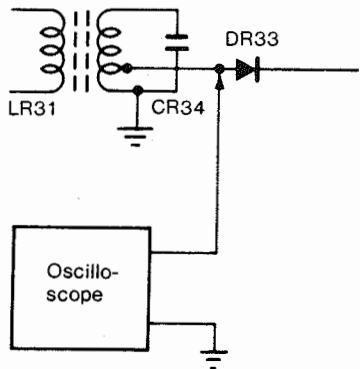


Figure 10. Equipment Connection

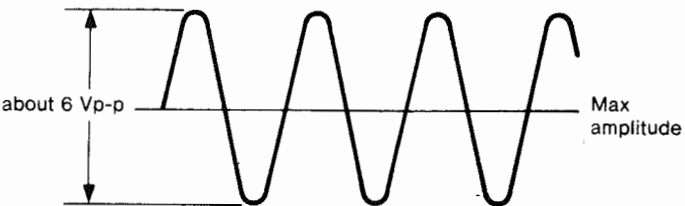


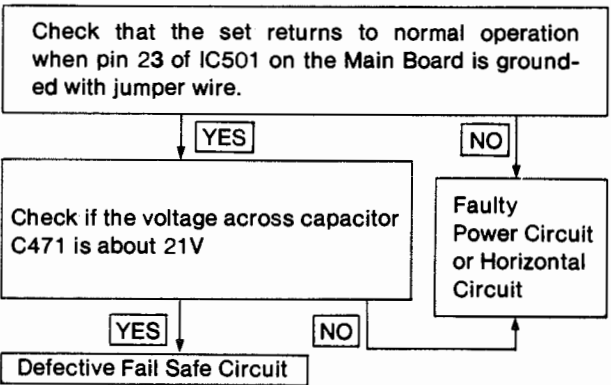
Figure 11. 37.9 kHz Waveform

FAIL SAFE CIRCUIT CHECK

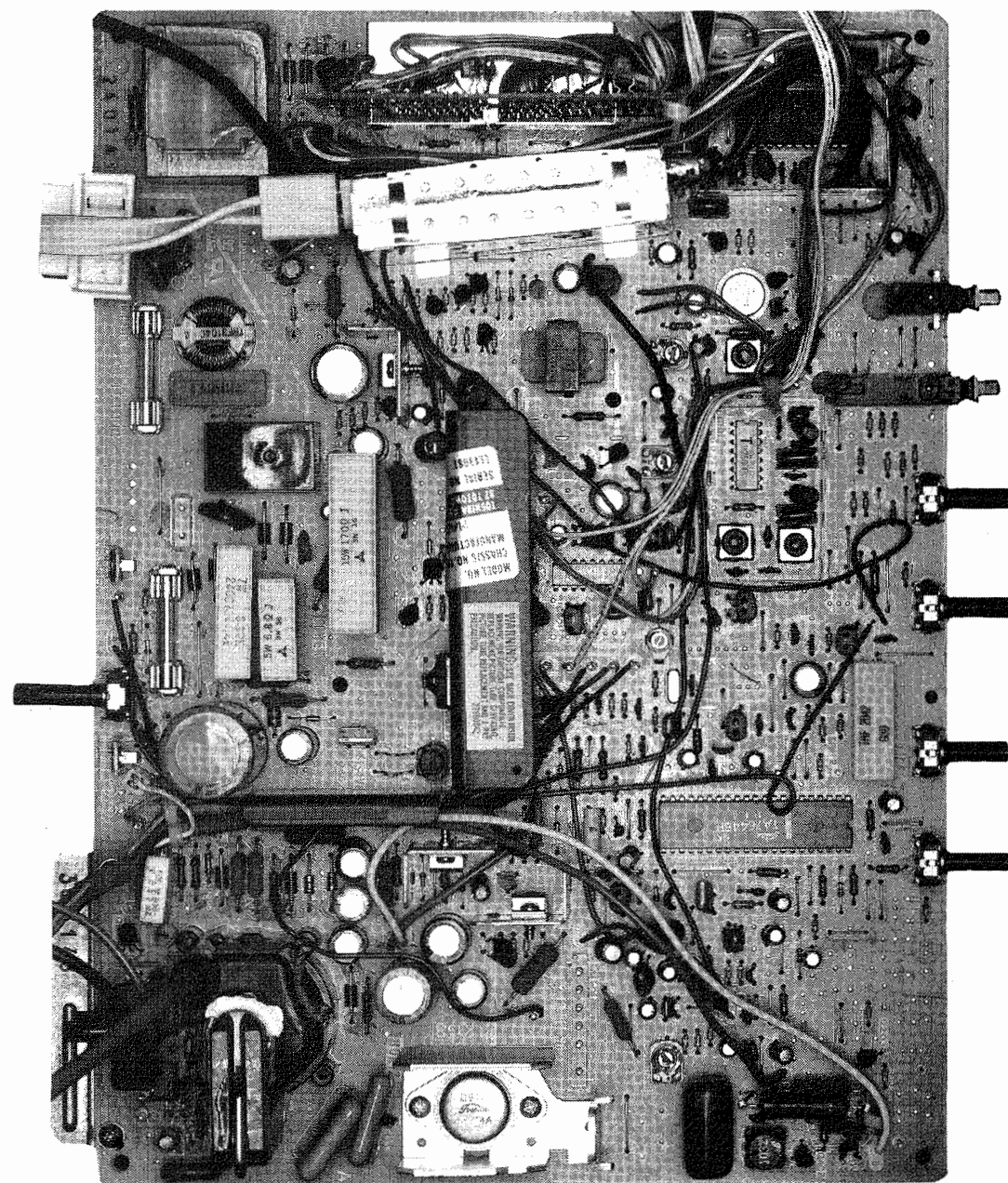
The Fail Safe (FS) circuit check is indispensable for the final check in the servicing. Checking should be done following the steps below.

1. Turn the power switch on and adjust customer controls for normal operation.
2. Temporarily short TP-R and TP-X on the Main Board with a jumper wire. Raster and sound will disappear.
3. The receiver must remain in this state even after removing the jumper wire. This is the evidence that the FS circuit is functioning properly.
4. To obtain a picture again, temporarily turn the receiver off and allow the FS circuit more than 30 seconds to reset. Then turn the power switch on to produce a normal picture.

Troubleshooting Guide for Fail Safe Circuit



Courtesy of the Manufacturer



MAIN BOARD-SHIELD LOCATION

TROUBLESHOOTING AID

Note: Waveforms taken with triggered scope, Keyed-Rainbow generator. Schematic voltages measured with digital meter, no signal. Controls adjusted for normal operation.

PICTURE or SOUND

NO PIC, NO SOUND, NO RASTER: Check AC power supply and sources generated from Horizontal Output Transformer (T461). Refer to "Troubleshooting" Power Supply and Horizontal circuits.

NO PIC, NO SOUND, HAS RASTER: Check IF-AGC and source voltages from Horizontal Output Transformer (T461). Refer to "Troubleshooting" IF-AGC and Horizontal circuits.

NO PIC, HAS SOUND, NO RASTER: Check Horizontal Output Transformer (T461) sources and Video circuit. Refer to "Troubleshooting" Horizontal and Video circuits.

NO PIC, HAS SOUND, HAS RASTER: Refer to "Troubleshooting" Video circuit.

HAS PIC, NO SOUND: Refer to "Troubleshooting" Audio circuit.

OVERLOADED PICTURE: Refer to "Troubleshooting" IF-AGC circuit.

LOW OR EXCESSIVE BRIGHTNESS: Check Video and Luminance circuits. Refer to "Troubleshooting" Video circuit.

SWEEP

NO RASTER, HAS SOUND: Check HV rectifier, Part of Horizontal Output Transformer (T461). Refer to "Troubleshooting" Horizontal circuit.

NO RASTER, NO SOUND: Refer to "Troubleshooting" Horizontal circuit.

NO VERT DEFLECTION: Refer to "Troubleshooting" Vertical circuit.

POOR VERT LIN OR FOLDOVER: Refer to "Troubleshooting" Vertical circuit.

POOR HORIZ LIN OR FOLDOVER: Refer to "Troubleshooting" Horizontal circuit.

NARROW PICTURE: Refer to "Troubleshooting" Horizontal circuit.

VERT OFF FREQUENCY: Refer to "Troubleshooting" Vertical circuit.

HORIZ OFF FREQUENCY: Refer to "Troubleshooting" Horizontal circuit.

SYNC

NO VERT/HORIZ SYNC: Refer to "Troubleshooting" Sync circuit.

RASTER

YELLOW (NO BLUE): Check Chroma and Blue Output circuits. Refer to "Troubleshooting" Raster circuit.

CYAN (NO RED): Check Chroma and Red Output circuits. Refer to "Troubleshooting" Raster circuit.

MAGENTA (NO GREEN): Check Chroma and Green Output circuits. Refer to "Troubleshooting" Raster circuit.

COLOR (B/W operating normally)

NO COLOR: Refer to "Troubleshooting" Chroma circuit.

WEAK COLOR: Refer to "Troubleshooting" Chroma circuit.

NO COLOR SYNC: Refer to "Troubleshooting" Chroma circuit.

NO GREEN: Check Chroma and Green Output circuits. Refer to "Troubleshooting" Raster circuit.

NO BLUE: Check Chroma and Blue Output circuits. Refer to "Troubleshooting" Raster circuit.

NO RED: Check Chroma and Red Output circuits. Refer to "Troubleshooting" Raster circuit.

INCORRECT HUE (TINT): Refer to "Troubleshooting" Chroma circuit.

MISCELLANEOUS ADJUSTMENTS

HIGH VOLTAGE CHECK

Connect a high voltage probe to the CRT HV anode. Turn Contrast and Brightness Controls to MINIMUM. Nominal high voltage is 25KV to 26.5KV. NOTE: There is no high voltage adjustment on this chassis. High voltage should not exceed 30.0KV.

AGC ADJUSTMENT

Tune in the strongest station available. Turn AGC Delay Control (R152) fully counterclockwise. Then turn clockwise until snow just disappears from the screen.

SUB BRIGHTNESS ADJUSTMENT

Tune in a color program and set ABC Switch to On. Set Contrast Control to Maximum and Brightness Control to click position. Set Color and Tint Controls to midrange. Set Sub Brightness Control (R257) to midrange and let receiver warm-up for five minutes. Advance Sub Brightness Control (R257) to a point just before picture starts to bloom. Check picture at all brightness levels and retouch Sub Brightness Control if necessary.

COLOR SYNC ADJUSTMENT

Connect a color bar generator to the antenna terminals and tune in a color bar pattern. Allow a 5 minute warm-up time. Connect a .47uF Capacitor from TP42 to TP100. Connect a 1000 ohm resistor from TP101 and TP102. Set ABC Switch to Off position. Tint Control fully counterclockwise, Color Control to Maximum and Contrast Control to MINIMUM. Adjust Color Sync Trimmer Capacitor (C551) untill color bars stop or slowly drift across the screen. When complete, remove test capacitor and resistor.

HORIZONTAL HOLD ADJUSTMENT

Tune in a station and adjust for a normal picture. Adjust Horizontal Hold Control (R451) to a point where it is virtually impossible to lose horizontal sync while switching from channel to channel.

GRAY SCALE ADJUSTMENT

Turn in a picture and set Color Control to MINIMUM. Set ABC Switch to Off position. Set Red (R557), Green (R558) and Blue (R559) Bias Controls to midrange. Set Green (R252) and Blue (R253) Drive Controls to midrange. Disconnect Raster Tip from TP13. Connect a jumper from Terminal G to Terminal H to produce a horizontal line. Rotate Screen Control (R951B) slowly clockwise until a second line appears. Turn the two Bias Controls corresponding to the colors of the lines on the screen until lines are just eliminated. Adjust the Screen Control (R951B) until a line just appears. Adjust the two Bias Controls to obtain a white line. Remove the jumper and reconnect the Raster Tip to TP13. Rotate Brightness and Contrast Controls to Maximum.

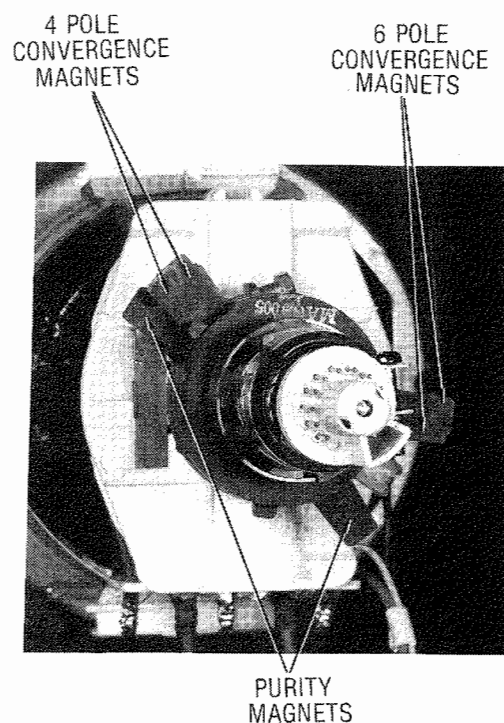
Adjust the Blue and Green Drive Controls for best white in high-light areas. Check tracking at low and high brightness. If necessary, retouch Bias Controls at low brightness and Drive Controls at high brightness.

PURITY ADJUSTMENT

NOTE: Before attempting any purity adjustments the receiver should be operated for at least fifteen minutes. Turn Contrast and Brightness Controls to Maximum. Use a degaussing coil to demagnetize the CRT. Adjust Red Bias Control (R557) and Blue Bias Control (R559) to obtain a green raster. Advance Green Bias Control (R558) if necessary. Loosen the clamp screw holding the yoke and slide the yoke backward to obtain a vertical green band. Rotate and spread the Tabs of the purity magnets until the green band is centered on the screen. Move the yoke slowly forward until a uniform green screen is obtained.

CONVERGENCE ADJUSTMENTS

NOTE: Before attempting convergence adjustments the receiver should be operated for at least fifteen minutes. Connect a color bar generator to the antenna terminals and tune in a crosshatch pattern. Adjust the Tabs of the 4-Pole Magnets to converge the red and blue vertical and horizontal lines at the center of the screen. Adjust the Tabs of the 6-Pole Magnets to converge the red, blue and green vertical and horizontal lines at the center of the screen. Remove the rubber wedges from the CRT. Tilt the yoke vertically and horizontally to converge edges of screen. Apply adhesive to wedges and carefully replace on CRT.



CRT NECK ASSEMBLY

PARTS LIST AND DESCRIPTION

When ordering parts, state Model, Part Number, and Description

SEMICONDUCTORS (Select replacement transistor for best results)

ITEM No.	TYPE No.	MFR. PART No.	REPLACEMENT DATA						
			GENERAL ELECTRIC PART No.	MOTOROLA PART No.	NEW-TONE NTE PART No.	PHILIPS ECG PART No.	RCA PART No.	WORKMAN PART No.	ZENITH PART No.
D201	IS 1555	A7246711	GE-300	1N4935	NTE177	ECG177	SK9091/177	WEP1062/177	103-131
D202	IS 1553	A7246602	GE-300	1N4935	NTE177	ECG177	SK9091/177	WEP1062/177	103-131
D203	OA91	23115535	IN60		NTE109	ECG109	SK3088	WEP134/109	103-29001
D204	IS 1555	A7246711	GE-300	1N4935	NTE177	ECG177	SK9091/177	WEP1062/177	103-131
D205	IS 1554	A7246653	GE-300	1N4935	NTE177	ECG177	SK9091/177	WEP1062/177	103-131
D206	IS 1555	A7246711	GE-300	1N4935	NTE177	ECG177	SK9091/177	WEP1062/177	103-131
D302 thru D304	IS 1555	A7246711	GE-300	1N4935	NTE177	ECG177	SK9091/177	WEP1062/177	103-131
D305, 306	EM1Z TVR-2D	23115621 A7568475	GE-504A GE-511	1N4003	NTE116 NTE552	ECG116 ECG552	SK3311 SK9000/552	WEP156 WEP172/506	212-76-02 103-287
D308	S5295G	A7978850	GE-511		NTE552	ECG552	SK9000/552	WEP172/506	103-287
D401	IS 1555	A7246711	GE-300	1N4935	NTE177	ECG177	SK9091/177	WEP1062/177	103-131
D441, 442	S5295G	A7978850	GE-511		NTE552	ECG552	SK9000/552	WEP172/506	103-287
D471	TVR-1B	A7568460	GE-511		NTE552	ECG552	SK9000/552	WEP172/506	103-287
D472	RD6.2EFA1	23115774	GEZD-6.2	1N5234B	NTE5013A	ECG5013A	SK6A2/5013A	WEP1414/5013	103-29008
D601	IS 1553	A7246602	GE-300	1N4935	NTE177	ECG177	SK9091/177	WEP1062/177	103-131
D802	IS 1555	A7246711	GE-300	1N4935	NTE177	ECG177	SK9091/177	WEP1062/177	103-131
D803	OSZ20Y	A7110634	GEZD-20	1N5250B	NTE5029A	ECG5029A	SK20A/5029A	WEP1431/5029	103-29023
D811 thru D814	IS 1887A	A7568752	GE-504A	1N4004	NTE116	ECG116	SK3312	WEP157	212-76-02
DA01	IS 1555	A7246711	GE-300	1N4935	NTE177	ECG177	SK9091/177	WEP1062/177	103-131
DB02	OSZ33Y	A7110743	GEZD-33	1N5257B	NTE5036A	ECG5036A	SK33A/5036A	WEP1438/5036	103-29004
DE01 thru DE08	IS 1885 IS 1885FA IS 1885FA	A7568521 A7568521 A7568521	GE-504A GE-504A GE-504A	1N4003 1N4003 1N5231B	NTE116 NTE5010A NTE5010A	ECG116 ECG5010A ECG5010A	SK3311 SK3A1/5010A SK3A1/5010A	WEP156 WEP1411/5010 WEP1411/5010	212-76-02 212-76-02 103-279-10
DE10	OSZ5.1X	A7110040	GEZD-5.1						
DH01, 02	IS 1555	A7246711	GE-300	1N4935	NTE177	ECG177	SK9091/177	WEP1062/177	103-131
DR34	OSZ6.8Y	A7110015	GEZD-6.8	1N5235B	NTE5014A	ECG5014A	SK6A8/5014A	WEP1415/5014	103-29009
DR36, 37	IS 1555	A7246711	GE-300	1N4935	NTE177	ECG177	SK9091/177	WEP1062/177	103-131
IC101	TA7660P TA7660PFA	B0356602			NTE1547	ECG1547	SK7676/1547 SK7678 SK7678		
IC501	TA7644BP	B0356446							
IC601	TA7664P	B0356641							
IC801	TA7664PFA-1 TD6306P TD6306PFA-1	B0356641 B0272054							

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PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

SEMICONDUCTORS (Select replacement transistor for best results) (cont)

ITEM No.	TYPE No.	MFRG. PART No.	REPLACEMENT DATA						
			GENERAL ELECTRIC PART No.	MOTOROLA PART No.	NEW-TONE NTE PART No.	PHILIPS ECG PART No.	RCA PART No.	WORKMAN PART No.	ZENITH PART No.
Q202	2SA562-0	A6509121 A6317547 A6324922 A6319550	GE-269	2N4403*	NTE290A	ECG290A	SK3114A/290A	WEP911/290A	121-Z9003*
	2SA562TM-0		GE-269	2N4403*	NTE290A	ECG290A	SK3114A/290A	WEP911/290A	121-Z9003*
	2SC1815-Y		GE-62	MPSA05*	NTE85	ECG85	SK3124A/289A	WEP66/199	121-Z9065
	2SC2229-0		GE-222*	MPSA42*	NTE399	ECG399	SK3244	WEP68/287*	121-Z9045*
	2SC2073		GE-375		NTE375	ECG375	SK3929	WEP763/375	121-Z9106
Q307	2SA940	A6532320 A6330004	GE-303	MJE15031	NTE398	ECG398	SK3950	WEP781/292	121-Z9115
	2SC2482-1		GE-222*	MPSA42*	NTE399	ECG399	SK9352/399	WEP68/287*	121-Z9045*
	2SC2482FA-1		GE-222*	MPSA42*	NTE399	ECG399	SK9352/399	WEP68/287*	121-Z9045*
	2SD0870		GE-222*	BU2080	NTE89	ECG89	SK9119/89	WEP89/89	121-Z9112
Q404	2SD870FA	A6848004		BU2080	NTE89	ECG89	SK9119/89	WEP89/89	121-Z9112
Q471	2SA1015-0	A6534021 A6330000	GE-82*	2N4403*	NTE290A	ECG290A	SK9132	WEP911/290A	121-Z9003*
	2SC2482		GE-222*	MPSA42*	NTE399	ECG399	SK9352/399	WEP68/287*	121-Z9045*
	2SC2482		GE-222*	MPSA42*	NTE399	ECG399	SK9352/399	WEP68/287*	121-Z9045*
	2SC2482		GE-222*	MPSA42*	NTE399	ECG399	SK9352/399	WEP68/287*	121-Z9045*
	2SC2230A-GR		GE-222*	MPSA42*	NTE399	ECG399	SK9352/399	WEP68/287*	121-Z9045*
Q604	2SC2230A-Y	A6325060	GE-222*	MPSA42*	NTE399	ECG399	SK9352/399	WEP68/287*	121-Z9045*
Q801	2SD1294	A6867051					SK9421		
Q802	2SD1294FA						SK9421		
Q805, 06	S1854-2	A6907753							
	S1854FA-2								
QA05, 06	2SA1015-Y	A6534045 A6317547 A6317547 A6317547	GE-82*	2N4403*	NTE290A	ECG290A	SK9132	WEP911/290A	121-Z9003*
QA07	2SC1815-Y		GE-62	MPSA05*	NTE85	ECG85	SK3124A/289A	WEP66/199	121-Z9065
QA09	2SC1815-Y		GE-62	MPSA05*	NTE85	ECG85	SK3124A/289A	WEP66/199	121-Z9065
QB02	2SK30A-1		GE-FET-1	MPF102*	NTE459	ECG459	SK3112	WEP801/133*	121-756*
	2SK30ATMFA-1		GE-FET-1	MPF102*	NTE459	ECG459	SK3112	WEP801/133*	121-756*
QB03	2SC1815-Y	A6048403 A6317547 A6317547 A6848908	GE-62	MPSA05*	NTE85	ECG85	SK3124A/289A	WEP66/199	121-Z9065
QC01	2SC1815-Y		GE-62	MPSA05*	NTE85	ECG85	SK3124A/289A	WEP66/199	121-Z9065
QE03	2SD1052A		GE-62	MPSA05*	NTE52	ECG52	SK9297/86	WEP66/199	121-Z9065
QE05	2SC1815-Y		GE-62	MPSA05*	NTE85	ECG85	SK3124A/289A	WEP66/199	121-Z9065
	2SA1015-Y		GE-82*	2N4403*	NTE290A	ECG290A	SK9132	WEP911/290A	121-Z9003*
QH01	2SA1015-Y	A6534045 A6330004	GE-82*	2N4403*	NTE290A	ECG290A	SK9132	WEP911/290A	121-Z9003*
	2SA1015-Y		GE-82*	2N4403*	NTE290A	ECG290A	SK9132	WEP911/290A	121-Z9003*
	2SC1815-Y		GE-62	MPSA05*	NTE85	ECG85	SK3124A/289A	WEP66/199	121-Z9065
	2SC1815-GR		GE-62	MPSA05*	NTE85	ECG85	SK3124A/289A	WEP66/199	121-Z9065
	QP01		2SC1815-Y	A6317547	GE-62	MPSA05*	NTE85	ECG85	SK3124A/289A

PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

CABINETS & CABINET PARTS (When ordering specify model, chassis & color)

ITEM	PART No.	ITEM	PART No.
Cabinet Front, Model CF913	23898178	Control Panel, Models CF903, CF913 and CJ950C	23830634
Cabinet Front, Models CF903 and CJ950C	23898417	Control Panel, Models CJ920C and CX9403	23886052
Cabinet Front, Models CJ920C and CX9403	23898208	Knob, Brightness, Contrast, Color and Tint, Models CF903, CF913, CJ950C and CX9403	23826559
Rear Cover, Models CF913, CJ920C, CJ950C and CX9403	23830634	Knob, Brightness, Contrast, Color and Tint, Model CJ920C	23826562
Rear Cover, Model CF903	23830563	Knob, ABC and Band Selector	23874948
Front Panel (Outer Shell) Models CF903, CF913 and CJ950C	23886208	Knob, On/Off/Volume	23826367
Front Panel (Outer Shell) Models CJ920C and CX9403	23886050		

WIRING DATA

High Voltage Lead	Use BELDEN No. 9867 (30 KV)
Shielded Hook-up Wire	Use BELDEN No. 8401 or 8421 (Single-Conductor) 8208 (Two-Conductor)
General-use Unshielded Hook-up Wire	Use BELDEN No. 8529 (Solid) Available in 13 Colors 8522 (Stranded) Available in 13 Colors
300-Ohm Tuner Input Lead	Use BELDEN No. 8225
75-Ohm Tuner Input Lead	Use BELDEN No. 8241
300-Ohm Antenna Lead-In	Use BELDEN No. 8275 (Foam Core) or 8285 (Foam Jacketed)
Antenna Rotor Cable	Use BELDEN No. 8464 (Flat) or 8484 (Round) 4-Conductor 8485 (Round) 5-Conductor 8488 (Round) 8-Conductor

PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

FUSE DEVICES

ITEM NO.	DESCRIPTION	MFGR. PART NO.		NOTES
		DEVICE	HOLDER	
# F801	3A @ 125V Slow Blow	23144942		
# F802	1.2A @ 125V Fast Acting	23144929		

For SAFETY use only equivalent replacement part.

MISCELLANEOUS

ITEM No.	PART NAME	MFGR. PART No.	NOTES
# E502	Wedge	23848937	Deflection Yoke
# H001	UHF/VHF Tuner	23121805	PTS Part Number 23121805
	UHF/VHF Tuner	EL522F	PTS Part Number EL522F
	UHF/VHF Tuner	23121801	PTS Part Number 23121801, Model CF903 only
	UHF/VHF Tuner	EL515F	PTS Part Number EL515F, Model CF903 only
K912	Remote Control	23120879	Hand Unit CT934
	Remote Control	23120849	Hand Unit CT950, Model CF903 only
# L901	Degaussing Coil	23200919	
# P001	Antenna Terminal Board	23142646	
# P801	Cord	23176953	
# S501	Switch	23145684	AC Power
SA01	Switch		ABC
SA02	Switch	23145861	Power On/Off, Part of Volume Control
SA03	Switch	23145861	Channel Up
SA04	Switch	23145683	Channel Down
# SR01	Relay	23146967	Band
	Relay	23146969	Power On/Off
# V901	CRT	19VNDP22	Power On/Off
		19VMKP22	
# V901A	Socket	23116495	CRT
V901M	Magnet	23102993	Convergence and Purity
X501	Crystal	23153988	3.58MHz Oscillator
XB01	Crystal	23153969	4.0MHz
Y125	Antenna	23124976	UHF, RUSSELL Replacement Antenna BOW-4H
Y126	Antenna	23124975	VHF, RUSSELL Replacement Assembly SIM-4H
Z101	Filter	A5610690	SAW
Z201	Filter	23107976	Ceramic, 4.5MHz Trap
Z601	Filter	23107980	Ceramic, 4.5MHz
Z602	Filter	23100977	Ceramic, 4.5 Phase Shifter
PC901	PC Board	23138528	CRT Board Assembly
U902	PC Board	23138287	Main Board Assembly
	PC Board	23138019	Main Board Assembly, Model CF903 only
UB01A	PC Board	23158989	Selector Board Assembly Model CF913 only
	PC Board	23138286	Selector Board Assembly Models CJ920C, CJ950C and CX9403
	PC Board	23138023	Selector Board Assembly Model CF903 only
UB01B	PC Board	23158988	Remote Sensor Board Assembly, Model CF913 only
	PC Board	23138285	Remote Sensor Board Assembly, Models CJ920C, CJ950C and CX9403
	PC Board	23138022	Remote Sensor Board Assembly, Model CF903
UB01C	PC Board	23158987	Channel Display Board Assembly, Model CF913
	PC Board	23138284	Channel Display Board Assembly, Models CJ920C, CJ950C and CX9403
UB01D	P.C. Board	23138021	Channel Display, Model CF903 only
	PC Board	23158986	Keyboard Assembly, Model CF913 only
	PC Board	23138283	Keyboard Assembly, Models CJ920C, CJ950C and CX9403
	PC Board	23138020	Keyboard Assembly, Model CF903

For SAFETY use only equivalent replacement part.

PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

SEMICONDUCTORS (Select replacement transistor for best results) (cont)

ITEM No.	TYPE No.	MFGR. PART No.	REPLACEMENT DATA				ZENITH PART No.
			GENERAL ELECTRIC PART No.	MOTOROLA PART No.	NEW-TONE NTE PART No.	PHILIPS ECG PART No.	WORKMAN PART No.
QR36	2SA1015-Y	A6534045	GE-82*	2N4403*	NTE290A	ECG290A	SK9132
QR37	2SC1627-Y	A6314446	GE-289A	2N4401	NTE289A	ECG289A	SK3449/297
QR38	2SA562-Y	A6509141	GE-269	2N4403*	NTE290A	ECG290A	SK3114A/290A
	2SA562TM-Y		GE-269		NTE290A	ECG290A	SK3114A/290A

For SAFETY use only equivalent replacement part.
* Lead configuration may vary from original.

ELECTROLYTIC CAPACITORS

Items Not Listed Are Normally Available At Local Distributors.

ITEM No.	RATING	MFGR. PART No.
C308	2.2 50V 10%	24617981
C317	2.2 50V 10%	24637997
C445	33 160V	24617981
		24640992

ITEM No.	RATING	MFGR. PART No.
C616	1 50V	24085031
CA01	1 25V NP	24085031
	1 25V NP	

For SAFETY use only equivalent replacement part.

CAPACITORS

Items Not Listed Are Normally Available At Local Distributors.

ITEM No.	RATING	MFGR. PART No.
C443	.43 200V 5%	24828434
C446	.0039 1.6KV 5%	24095510
C447	.0039 1.6KV 5%	24095510
C448	.0022 200V 10%	24833223
C551	2.5-25pF Trimmer	24094541
C801	.068 125VAC	24095953
		24095954

ITEM No.	RATING	MFGR. PART No.
C812	.0022 250VAC	24094909
C813	.0022 250VAC	24094909
CA17	560 N750 5%	24340561
ZB01	Capacitor Network	24094814 (1)

For SAFETY use only equivalent replacement part.
(1) Contains six .01uF 50V.

PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

CONTROLS (All wattages 1/2 watt, or less, unless listed)

ITEM NO.	FUNCTION	RESISTANCE	MFGR. PART NO.	NOTES
R152	AGC Delay	5000	24061669	
R158	AFT Balance	500K	24061663	
R252	Green Drive	200	24061800	
R253	Blue Drive	200	24061800	
R254	Contrast	10K	24063994	
R255	Brightness	10K	24060498	
		Detent @ 50%		
R257	Sub Brightness	2000	24061658	
# R351	Vert Hold	200K	24063950	
R352	Vert Height	10K	24061656	
R451	Horiz Hold	10K	24061668	
R554	Tint	10K	24063994	
R555	Color	10K	24063994	
R557	Red Bias	10K	24061795	
R558	Green Bias	10K	24061795	
R559	Blue Bias	10K	24061795	
# R651	Volume	10K	24060193	
# R951A	Focus		(1)	
# R951B	Screen		(1)	

For SAFETY use only equivalent replacement part.

(1) R951A and R951B are part of Horiz Output Transformer, T461 Part No. 23226510.

RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		MFGR. PART No.	NEW-TONE PART No.	WORKMAN PART No.
# R216	62K 5% 1/8W Carbon Film	24360623		
# R217	56K 5% 1/6W Carbon Film	24366563		
# R318	11 5% 1/2W Metal Oxide	24962110	HW011	
# R320	8.2 5% 1W Metal Oxide	24983829	1W8D2	22-3046
R406	15K 2% 1/4W Metal Film	24003990	QW315	22-2254
R407	150K 2% 1/6W Carbon Film	24367154		
# R409	11K 5% 2W Metal Oxide	24964113	2W311	
R411	3900 2% 1/4W Metal Film	24003989	QW239	22-2248
# R426	3000 5% 3W Metal Oxide	24965302		
# R441	6.8 5% 1/2W Metal Oxide	24982689	HW6D8	
# R442	5.6 5% 1W Fusible	24547569		
# R475	390 2% 1/6W Carbon Film	24367391		
# R478	15K 1% 1/4W Metal Film	24327153		
# R482	5100 5% 1/4W Metal Film	24327512	QW251	
# R613	1500 5% 1W Fusible	24532152		
# R801	3.3 10% 7W WW	24007941		
# R802	170 5% 15W WW	24007953		
# R805	510 5% 1/2W Metal Oxide	24381511	HW151	
# R819	1M 5% 1/2W Carbon	24942105	HW510	
# R820	6.8 5% 5W WW	24007952	5W6D8	
# R910	6 Cold PTC	24000957	FR605	
# R920	2.4 5% 2W Fusible	24000906		
# RB04	16K 5% 2W Metal Oxide	24964163	2W316	
# RB08	620 2% 1/6W Carbon Film	24367621		
# RB09	15K 2% 1/6W Carbon Film	24367153		
# RB12	180K 2% 1/6W Carbon Film	24367184		
# RR47	240 5% 2W Metal Oxide	24380510		
# RR48	110 5% 2W Metal Oxide	24964111	2W111	
ZA03	Resistor Block	24000939 (1)		

For SAFETY use only equivalent replacement part.

(1) 6, 12K, 1/8 Resistors.

PARTS LIST AND DESCRIPTION (Continued)

When ordering parts, state Model, Part Number, and Description

COILS (RF-IF)

ITEM No.	FUNCTION	MFGR. PART No.	ITEM No.	FUNCTION	MFGR. PART No.
L102	Video IF	23262983	L441	RF Choke	23261974
L103	Video IF	23262882	L443	RF Choke	23261035
L104	Peaking	23285240	L501	Peaking	23285300
		23287240			23287300
		23283240			23283300
L105	Peaking	23261052	L521	RF Choke	23283331
L106	RF Choke	23261052	L601	Peaking	23285130
L161	Peaking	23261970			23287130
		23221977			23283130
		23262951			23221026
L171	AFT	23262882	L801	RF Choke	23283829
L201	Peaking	23283150	LB02	RF Choke	23221026
L203	Peaking	23283270	LH01	RF Choke	23221026
L204	Peaking	23283180	LR31	Tuning	23232988
L401	RF Choke		T801	Line Filter	23211982
			X201	Delay Line	23250964

COILS & TRANSFORMERS (Sweep Circuits)

ITEM No.	FUNCTION	REPLACEMENT DATA		
		MFGR. PART No.	OTHER IDENTIFICATION	THORDARSON PART No.
# L462	Yoke Horiz 2.36mH	23227870	TDY-3207B (1)	
T401	90° Vert 92mH	23224988	1032 (1)	
# T461	Horiz Driver	23226510	TFB4003AD (1)	
	Horiz Output			

For SAFETY use only equivalent replacement part.

(1) Number on unit.

TRANSFORMER (Audio Output)

ITEM No.	IMPEDANCE		REPLACEMENT DATA.		NOTES
			MFGR. PART No.	THORDARSON PART No.	
	PRI.	SEC.			
# T661	1003	8	23216941 TSP1063 (1)		

For SAFETY use only equivalent replacement part.

(1) Number on unit.

TRANSFORMER (Power)

ITEM No.	RATING			REPLACEMENT DATA		
				MFGR. PART No.	THORDARSON PART No.	NOTES
	PRI.	SEC. 1	SEC. 2			
# T802	120V AC 55.9mA AC	11.39V AC 153mA ADC	15.02V AC 85.1mA DC	23213899 TP1217 (1)		

For SAFETY use only equivalent replacement part.

(1) Number on unit.

SPEAKER

ITEM No.	TYPE	REPLACEMENT DATA		NOTES
		MFGR. PART No.	QUAM PART No.	
W661	4" PM 8 Ohms	23151525 SPK1082 (1)	4A1Z8	(1) Number on unit.